PB89-117394

Superfund Record of Decision (EPA Region 2)
York Oil Company, New York
February 1988 (First Remedial Action)

(U.S.) Environmental Protection Agency
Washington, DC

9 Feb 88

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-88/054
February 1988

PB89-117394

EPA

Superfund Record of Decision:

York Oil Company, NY

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Supplementary Notes

Abstract (Limit: 200 words)

The York Oil Company site, encompassing 17 acres, is located in the Hamlet of Moira, ranklin County, New York. Wetlands and woodlands are the principal land use in the icinity of the site. Residences exist along the main roads interspersed with ctive/inactive agricultural and pasture land. The now dissolved York Oil Company perated a waste oil recycling facility from 1964 to 1977. Crankcase industrial oils, some containing PCBs, were collected from sources throughout New England and New 'ork, then stored and/or processed at the site in eight above-ground storage tanks, a series of three earthen-damned settling lagoons, and at least one below-ground storage ank. The recycled PCB-contaminated oil was either sold as No. 2 fuel oil or used in lust control for the unpaved roads in the vicinity of the site. During heavy rains and spring thaws, the oil-water emulsion from the lagoons would often overflow onto the surrounding lands. In lieu of paying damages to adjacent farm-owners, in 1964 the oil company purchased land in the area of the spills. The York Oil site contamination was first discovered in 1979 by a New York State Department of Transportation road crew, who then notified the New York State Department of Environmental Conservation (NYSDEC).

(See Attached Sheet)

. Document Analysis a. Descriptors
Record of Decision
York Oil, NY
First Remedial Action
Contaminated Media: gw, sediments, soil, sw
Key Contaminants: metals, PCBs, phenols, VOCs

b. Identifiers/Open-Ended Terms

)SATI Field/Group

. Availability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 205

22. Price PC$28.95 / MF $6.95

SI-Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

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EPA/ROD/R02-88/054
York Oil, NY
First Remedial Action

16. ABSTRACT (continued)

Several removal actions have been undertaken at the site to contain the PCB-contamination problem. Currently, soils, sediments, ground water, and surface water are contaminated with PCBs, VOCs, metals, and phenols.

The selected remedial action for this site includes: excavation of 22,000 yd^3 of contaminated soil and 8,000 yd^3 of contaminated sediments with onsite solidification followed by onsite disposal of treatment residuals; installation of deep ground water drawdown wells and shallow dewatering wells to collect the sinking contaminant plume and the oil during excavation, with onsite treatment and subsequent discharge in accordance with New York State NPDES requirements; offsite thermal treatment of approximately 25,000 gallons of contaminated tank oils in addition to other soils collected at the site; cleaning and demolition of the empty storage tanks; and grading. Treatability studies will determine the effectiveness of the solidification process and optimal treatment system for groundwater. The estimated capital cost for this remedial action is $6,500,000, with present worth O&M of $500,000.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

York Oil Company site, Hamlet of Moira, Franklin County, New York

STATEMENT OF PURPOSE AND BASIS

This decision document represents the selected remedial action for the York Oil Company site, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) 42 U.S.C. § 9601, *et. seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 C.F.R. Part 300, November 20, 1985.

This decision is based upon the Administrative Record for the York Oil Company site. The attached index identifies the items which comprise the Administrative Record upon which the selection of a remedial action is based. Among the documents relied upon are:

- Remedial Action Master Plan, CDM, November 1982.
- Remedial Investigation/Feasibility Study, Erdman, Anthony, Associates, August 1985.
- Addendum Feasibility Study, Erdman, Anthony, Associates, November 1987.
- Attached Summary of Remedial Alternative Selection for the York Oil Company Site.
- Attached Responsiveness Summary, January 1988.

A copy of the Administrative Record is located at the following locations:

- Moira Town Hall
  North Lawrence Road
  Moira, New York 12957
- New York State Department of Environmental Conservation
  Route 86
  Ray Brook, New York 12977
- U.S. Environmental Protection Agency
  Emergency and Remedial Response Division
  26 Federal Plaza
  New York, New York 10278

DESCRIPTION OF SELECTED REMEDY

The remedial alternative presented in this document is the first operable unit of a permanent remedy for the York Oil site. The remedy includes:

- Excavation of approximately 30,000 cubic yards of contaminated soils followed by on-site solidification of this material. This volume includes excavation of approximately 8,000 cubic yards of contaminated sediments from the adjacent strip of land west of the site;
- Installation of deep groundwater drawdown wells along the southern and western perimeter of the site to collect the sinking contaminant plume, and installation of shallow dewatering wells to collect contaminated groundwater and oil during excavation;
- On-site treatment of the collected contaminated groundwater and oils with subsequent discharge of the treated groundwater in accordance with New York State Pollutant Discharge and Elimination System requirements;
- Off-site thermal treatment of approximately 25,000 gallons of contaminated tank oils in addition to other oils collected at the site in accordance with the Resource, Conservation and Recovery Act 40 CFR § 264 Subpart O and the Toxic Substances Control Act 40 CFR § 761.70 requirements;
- Cleaning and demolition of the empty storage tanks;
- On-site disposal of the solidified soil and surface grading; and
- Since the solidified soil will remain on-site, the remedy will be reviewed every five years to assure that human health and the environment are being protected.
- Treatability studies during the remedial design to determine the effectiveness of the solidification process and to determine the optimal treatment system for the contaminated groundwater. Should the treatability study determine that solidification would not provide the desired degree of treatment, then a treatability study would be performed to determine the effectiveness of thermally treating the soils at the site.

This Record of Decision (ROD) addresses only source control measures for the York Oil site. An additional operable unit remedial investigation/feasibility study for the contamination pathways is in progress to further define the extent of the contamination migration from the site. If additional remedial actions are determined to be necessary, a ROD will be prepared for approval of future remedial action.

DECLARATIONS

Consistent with CERCLA as amended, and the NCP, I have determined that the selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The action will require future operation and maintenance (O&M) activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Superfund monies for a period of up to one year. The O&M associated with the first three years of related deep well pumping and associated groundwater treatment is, however, part of the proposed remedial action. Therefore, the O&M costs during these three years will be cost-shared with the State. After the three years, any additional O&M pumping costs will be funded utilizing state funds.

The State of New York has been consulted with and agrees with the approved remedy (see attached).

I have also determined that the action being taken is appropriate when balanced against the availability of Superfund monies for use at other sites.

February 9, 1988
Date

Christopher J. Daggett
Regional Administrator

ROD DECISION SUMMARY

YORK OIL COMPANY SITE

NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2
New York

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ROD DECISION SUMMARY
YORK OIL COMPANY SITE
NEW YORK

This summary addresses the site proper operable unit, which involves addressing the source of contamination to prevent further contaminant migration from the site, and to eliminate the direct contact threat posed by the site (1). A subsequent operable unit remedial investigation/feasibility study (RI/FS) is in progress to further define the extent of the contaminant migration from the site.

SITE LOCATION AND DESCRIPTION

The York Oil site was placed on the National Priorities List of known or threatened releases in July 1982. The 17-acre site proper, is located in a rural area in northeastern New York State, approximately one mile northwest of the Hamlet of Moira in Franklin County, New York (see Figure 1). It was formerly used as a waste oil recycling facility, and eventually the site became a tank and lagoon storage facility for PCB-laden waste oil. The site is bounded on the north and east by private homes, and on the west and south by wetlands and woodlands.

Wetlands and woodlands are the principal land use in the vicinity of the York Oil site. Residences exist along the main roads interspersed with active/inactive agricultural and pasture land. Although the area is rural, there are an estimated 1,700 inhabitants within a three mile radius of the site. There are thirteen residences, housing approximately forty persons, located within one half-mile of the site, with the nearest being approximately 300 feet from the eastern boundary of the site. Private wells serve as the sole drinking water supply for area residents.

The Town of Moira's Highway Department garage and sand/salt/gravel stockpile is located on North Lawrence Road adjacent to the site to the northwest, and employs approximately ten persons. Adjacent to the site to the southeast exists an abandoned milk plant. An abandoned railroad embankment, running east/west, is the southern boundary of the site. This track provides access to the woodlands and wetlands around the site for hunters, hikers, and recreational vehicles.

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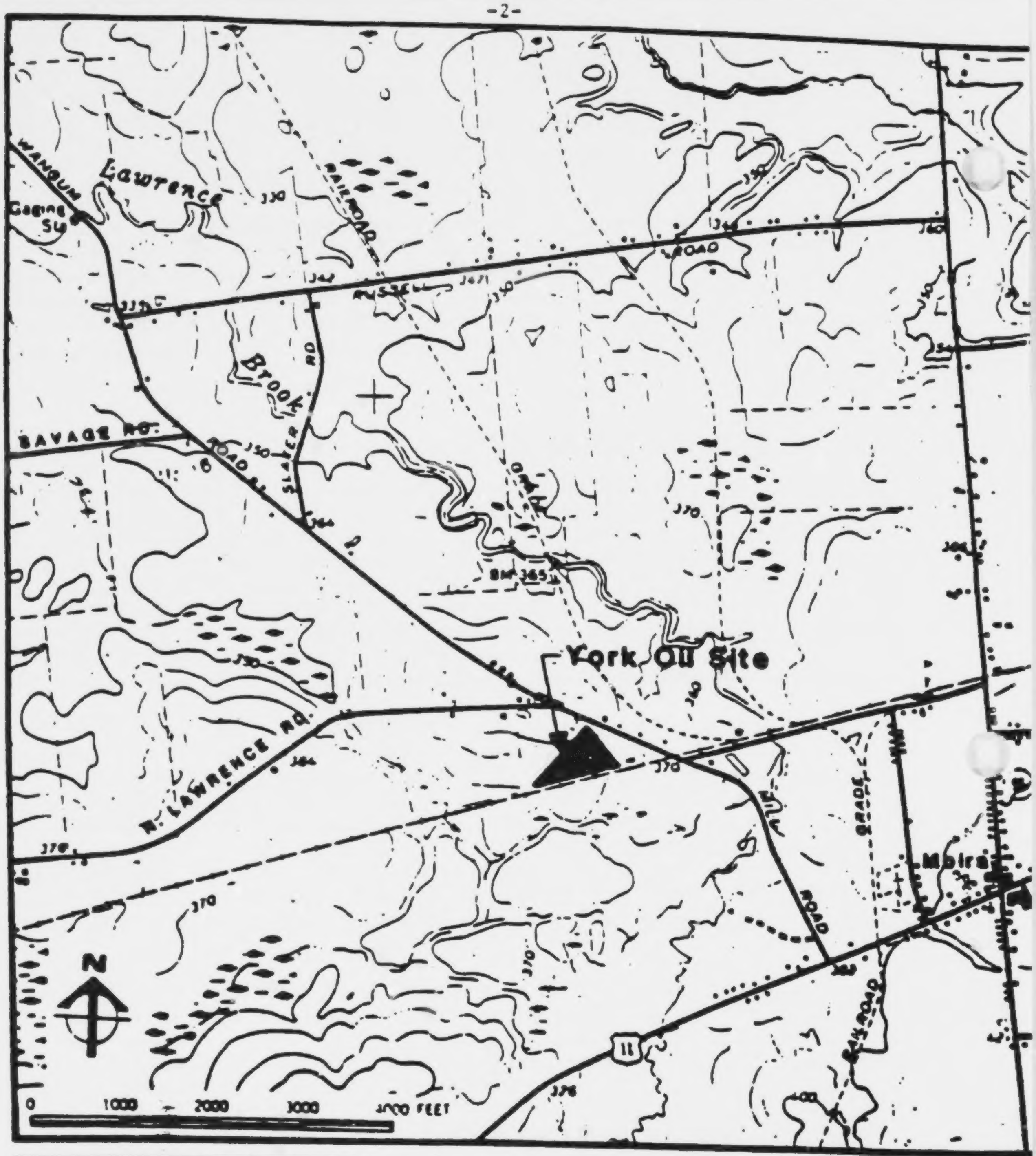
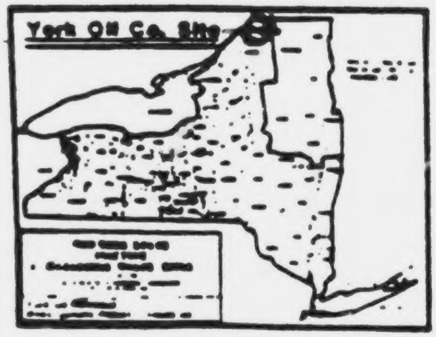
(1) The site proper is defined as all York Oil Company lands, including the fenced portion of the site, and the 1000 ft. by 200 ft. strip of land located to the west of the fenced area (see Figure 2).

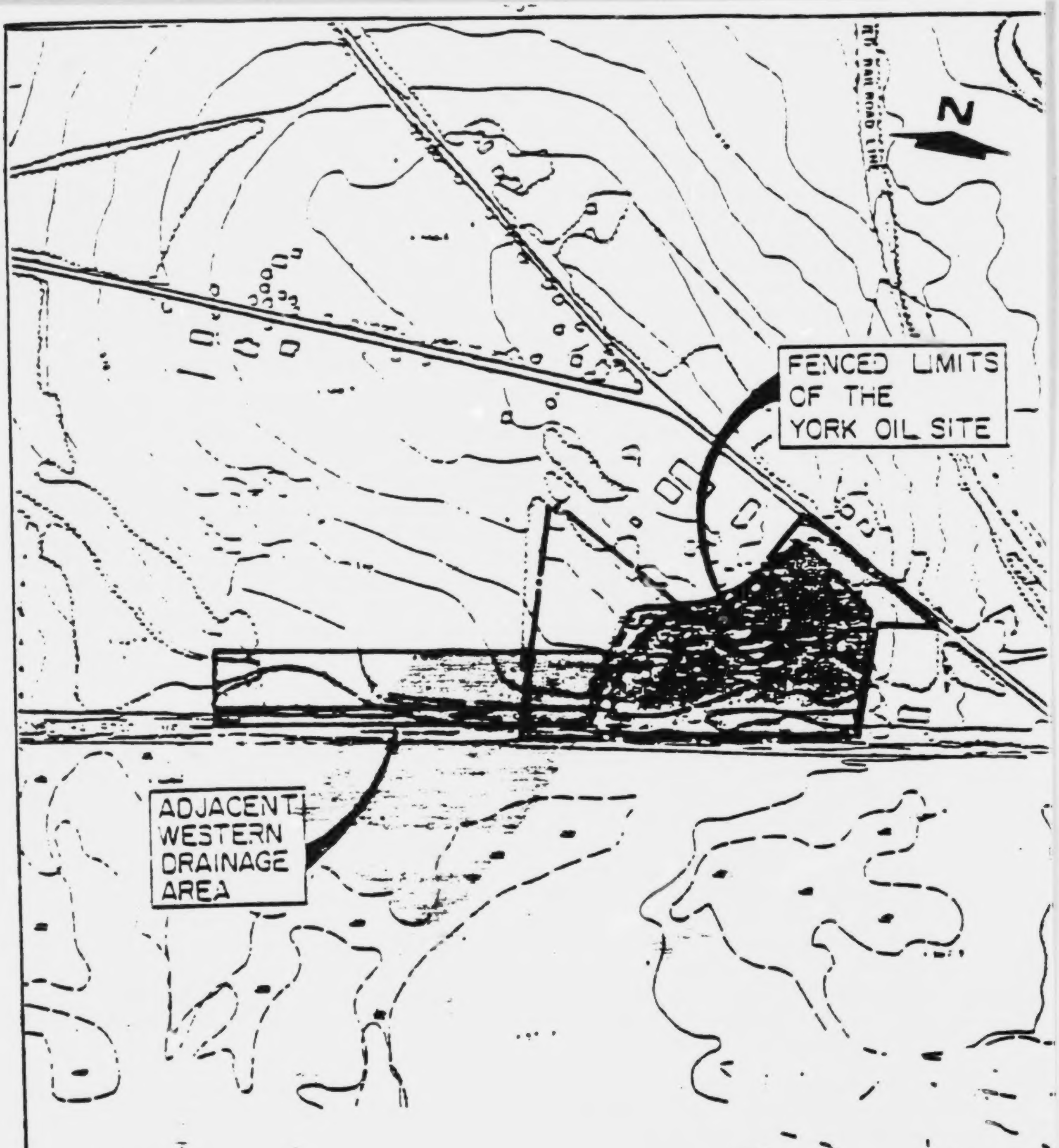

Lawrence
Brook
RUSSELL
ROAD
RAILROAD
SAVAGE RD.
ROAD
SLATER
RD
BM 365
York Oil Site
N. LAWRENCE RD.
ROAD
GRADE
RAILROAD
Moira
11
350
370
N
0
1000
2000
3000
4000 FEET


York Oil Co. Site

York Oil Remedial
Investigations Report

LOCUS PLAN

FIGURE NO. 1


N
FENCED LIMITS OF THE YORK OIL SITE
ADJACENT WESTERN DRAINAGE AREA
RAIL ROAD LINE

LEGEND

APPROX. LIMITS OF FORMER YORK OIL CO., INC. (TAKEN FROM A MAP PREPARED BY FOURTH COAST POLLUTION CONTROL, INC. - 1983)

APPROX. LIMITS OF PROJECT STUDY AREA

GZA

0 200 400 600 feet
SCALE 1" = 400'

YORK OIL SITE
MOIRA, NEW YORK

ADDENDUM FS
SITE BOUNDARIES AND STUDY AREA

OCT. 1987

FIGURE

The York Oil site is located within the Lawrence Brook watershed, which drains portions of northwestern Franklin County and northeastern St. Lawrence County. Two major tributaries, Alburg Brook and Joy Brook flow north merging to form Lawrence Brook. Lawrence Brook flows north, turning northwest near the site and the closest point is about 1250 feet from the site. Approximately six miles downstream of the site, Lawrence Brook flows into Deer River. Deer River flows into the St. Regis River and ultimately into the St. Lawrence River.

The site is situated on the side of a glaciated hill that slopes from the northwest to the southwest. Lawrence Brook meanders around the glaciated hill to the east. The ground surface away from the site decreases gradually to a drainage trench along the abandoned railroad grade (see Figure 3). This trench connects to a poorly defined drainage pathway flowing northwesterly through a series of wetlands and ultimately to Lawrence Brook. South of the railroad grade is a wetland area where surface waters flow to the south into Lawrence Brook, and to the north towards a culvert under the railroad grade, which finally drains into the western wetlands.

The site drainage is influenced by a man-made interceptor trench located west of the consolidated lagoon areas, that has been constructed on the site during remedial work in 1980 and 1981. The interceptor trench channels runoff from part of Area A toward the southern portion of the site and into a drainage ditch which runs parallel and adjacent to the north side of the railroad embankment (see Figure 4). This drainage ditch also picks up the remainder of Area A runoff not flowing into the interceptor trench. It then carries flow toward the wetlands to the west and northwest of the project site. This runoff flows to a larger wetland area six miles north of the site. The direction of flow beyond the wetlands include Lawrence Brook, the Deer River and terminating with the St. Lawrence River.

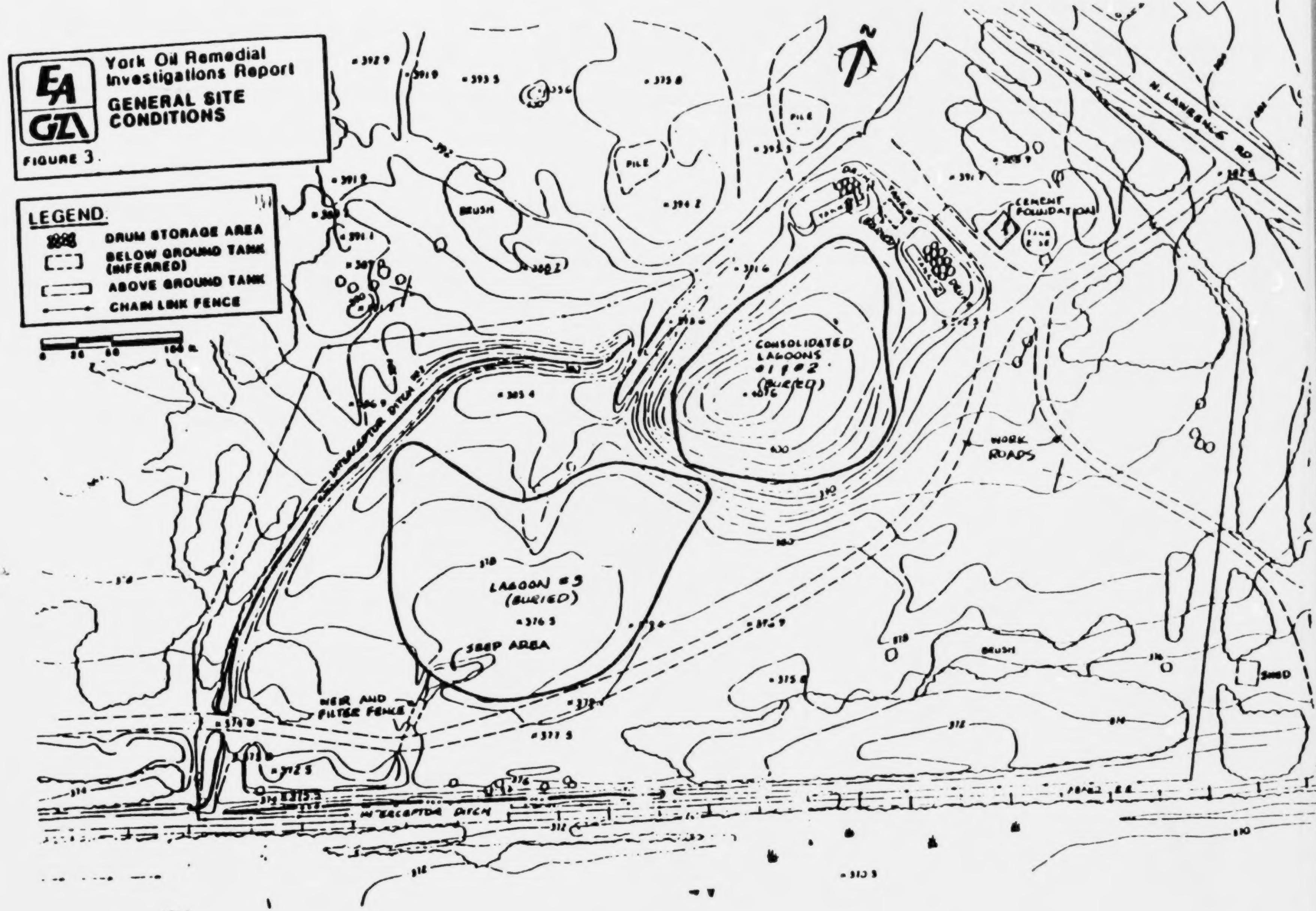
The runoff from Area B is toward the south-southeast. Near the southern corner of the site, a divided flow condition exists at the drainage trench with a slight easterly flow under high flow conditions. East of the abandoned milk plant, there exists a ditch approximately 250 feet long that provides some retention capacity for this flow. When this capacity is exceeded, the water then flows through an 18-inch diameter culvert beneath the abandoned railroad tracks near the intersection of Mill Road and North Lawrence Road.

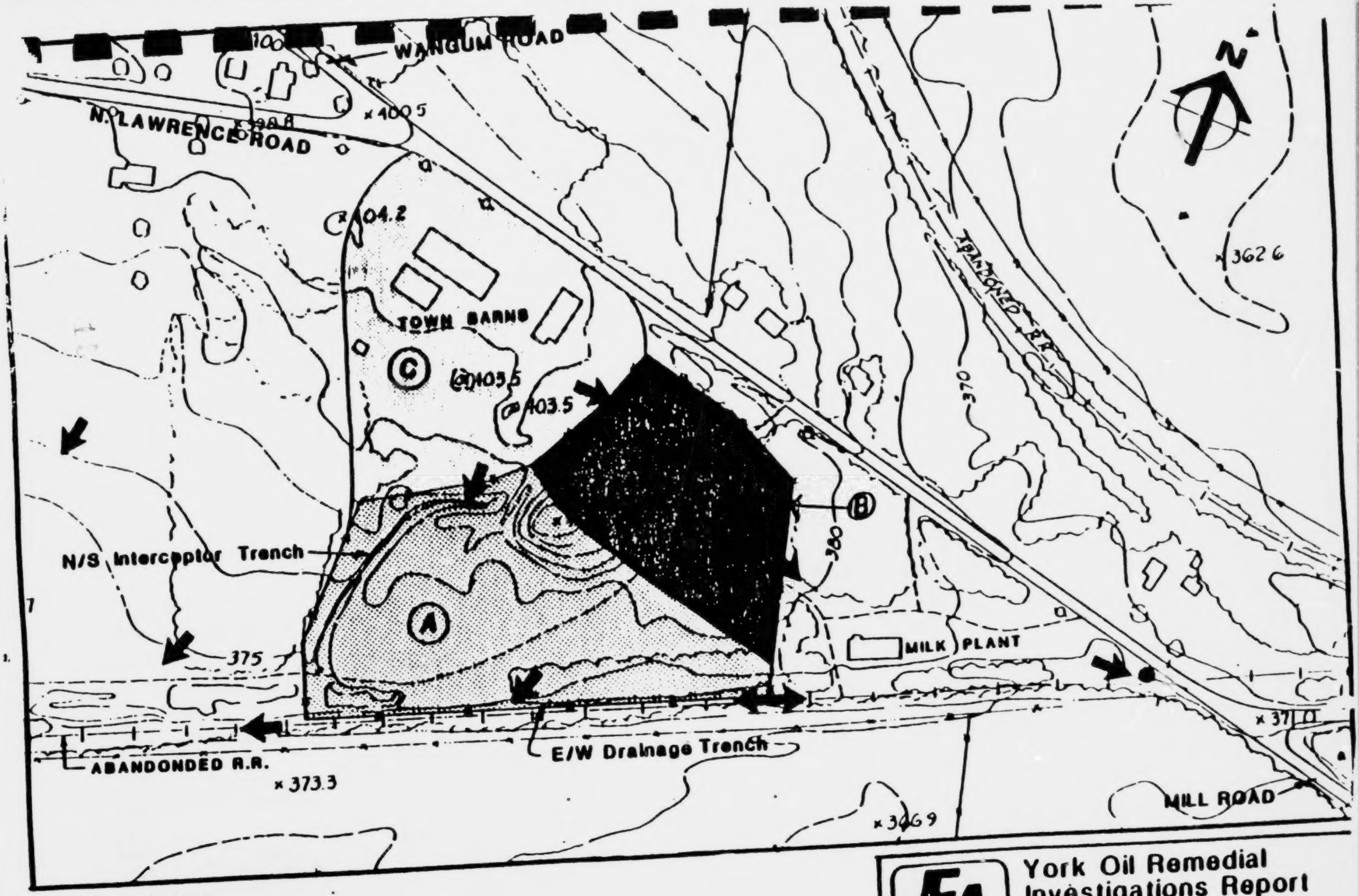
Runoff from Area C which includes the Moira Town garage property, flows onto the York Oil site. Approximately half of this runoff enters Area A and is channeled into the drainage ditch which

York Oil Remedial Investigations Report

GENERAL SITE CONDITIONS

FIGURE 3


EA
GZA
LEGEND
DRUM STORAGE AREA
BELOW GROUND TANK (INFERRED)
ABOVE GROUND TANK
CHAIN LINK FENCE
0
25
50
100 ft.
N
N. LAWRENCE RD.
PILE
PILE
BRUSH
CEMENT FOUNDATION
TANK
DRUMS
TANKS (BURIED)
CONSOLIDATED LAGOONS #1 & #2 (BURIED)
WORK ROADS
LAGOON #3 (BURIED)
SEEP AREA
WEIR AND FILTER FENCE
INTERCEPTOR DITCH #1
INTERCEPTOR DITCH
BRUSH
SHED
R.R.


WANGUM ROAD
100
N. LAWRENCE ROAD
x 400.5
398.8
x 404.2
TOWN BARNS
C
403.5
403.5
ABANDONED R.R.
x 362.6
370
B
380
A
N/S Interceptor Trench
375
MILK PLANT
x 371.0
ABANDONDED R.R.
x 373.3
E/W Drainage Trench
x 366.9
MILL ROAD
N

LEGEND

← Generalized Surface Flow

● 18" Culvert

EA ERDMAN ANTHONY ASSOCIATES

York Oil Remedial Investigations Report

SITE DRAINAGE AREAS

SCALE in FEET 100' 0 100'

FIGURE 4

flows toward the western wetlands. The portion entering Area B flows toward the 18-inch diameter culvert previously described.

The Lawrence Brook 100 year storm flood zone is not within the site proper boundaries. Areas adjacent to the site experience periodic flooding as a result of high intensity storms and rapid snow melt, but are not affected by the Lawrence Brook 100 year floodway.

RI activities indicate that subsurface conditions at the site generally consist of glacial overburden deposits that overlie sedimentary bedrock. While the thickness of the overburden varies, it is about forty feet thick within the fenced boundaries of the site.

The overburden and bedrock occur in layers of more permeable and less permeable materials that are capable of producing and/or transmitting ground water, or are barriers to groundwater flow, respectively. Five soil deposits have been identified with respect to groundwater flow.

A significant geohydrologic factor which exists throughout the site overburden is the presence of a glacial till layer ranging in thickness from five to twenty feet. This confining till layer overlying bedrock has an average hydraulic conductivity of approximately 3×10^{-4} ft/day and is a barrier to groundwater flow. This hydraulic characteristic is very important for the York Oil Company site since it protects residential wells that are screened in the bedrock, from contamination emanating from the site. Another factor which affects groundwater flow is the cobble and boulder layer which may potentially be the prominent water bearing zone.

The bedrock, particularly along discontinuities and fracture zones, is a transmissive zone capable of producing and carrying groundwater. The majority of the nearby residents obtain potable water from the bedrock at depths of approximately 100 feet. The bedrock groundwater contours reveal a divide located immediately north of the site. Thus, groundwater flow in the bedrock at the site is to the south.

Regional groundwater flow directions in the overburden deposits indicate a mound within the glaciated hill beneath the site. The flow from this mound is generally radial and thus, the flow generally enters the site from the north. Overburden groundwater flows are altered by several localized on-site features, including drainage trenches and the mounded fill covering the former lagoons. Groundwater flow off the mound is generally southward, and a divergence was observed in this area, with flows to both the southeast and southwest. The groundwater divergence appears to be related to the more permeable cobble and nested boulder layer.

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On-site groundwater and oil either mix with the regional groundwater flow and continue southward, or discharge to surface locations. The surface discharge locations include the wetlands south of the site, the east-west trending drainage channel along the railroad grade or the north-south trending drainage channel.

Overburden groundwater levels revealed seasonal variations during the RI activities that range from approximately 2 to 5 feet. The observed seasonal variations do not, however, alter groundwater flow directions.

The quantity of water, including incoming groundwater and infiltration, is difficult to estimate as the thickness and lateral extent of the cobble and boulder layer is variable. Based on explorations, however, it is estimated that the average water quantity may range from 10 to 15 gal/min, averaged over an entire year.

A six foot high chain link fence surrounds the York Oil site which was intended to limit access during remedial activities. This fence does not, however, limit access to the adjacent strip of land and the wetlands. The dominant surface feature at the site is an approximately twenty-five foot high mound of sandy materials covering former lagoons #1 and #2 (see Figure 3). This mound represents materials (i.e., contaminated oil sludges and soils) collected during previous site clean-up activity, and then temporarily consolidated with kiln dust and sand. West of the mound, sand covers former lagoon #3. This area is relatively flat and contains PCB-contaminated soils.

North of the former lagoons exists two, 25,000 gallon above ground horizontal steel storage tanks, designated as tank No. 2 and No. 3. They contain a combined total capacity of approximately 25,000 gallons of contaminated oil, and sludge, which was pumped into them during past clean-up efforts. One empty subsurface horizontal steel storage tank, with a volume estimated to be 5,000 to 10,000 gallons, also remains on-site. Within the bermed areas near Tank 2 and 3, approximately ninety 55 gallon drums containing site cleanup equipment, are stored, awaiting future disposal.

SITE HISTORY

The now dissolved York Oil Company, Inc. of Waltham, Massachusetts operated a waste oil recycling facility in Moira, New York from approximately 1964 to 1977. Crankcase industrial oils, some containing PCBs, were collected from sources throughout New England and New York, then stored and/or processed at the site proper in eight above-ground storage tanks, a series of three earthern-dammed settling lagoons, and at least one below-ground storage tank. The recycled PCB-contaminated oil was either sold as No. 2 fuel oil or was used in dust control for the unpaved roads in the vicinity of the site.

During heavy rains and spring thaw, the oil-water emulsion from the lagoons would often overflow onto the surrounding lands. In lieu of paying damages to adjacent farm-owners, in 1964 the York Oil Company purchased land in the area of the spills.

The York Oil site contamination was first discovered in 1979 by a road crew of the New York State Department of Transportation, who then notified the New York State Department of Environmental Conservation (NYSDEC). The site was then an abandoned oil tank farm and ownership of the property was confirmed as belonging to Kenneth Peirce. Initial government response to oil spills at the site was performed under the the State of New York Oil Spill Compensation Fund, and involved various surveys, inspections, and limited cleanup and containment work. Analysis taken at this time indicated that the site presented a PCB-contamination problem.

Because the PCB-contaminated oils were being washed from the site with the surface runoff, the U.S. Environmental Protection Agency (USEPA) was notified by the NYSDEC and subsequently undertook several emergency actions at the site since 1979. As part of the USEPA emergency action, the lagoons were drained and PCB-contaminated oil was transferred to the above-ground storage tanks (see Figure 2); the contaminated soils from the adjacent western strip of land were temporarily consolidated in lagoons 1 and 2 with kiln dust and sand, and lagoon 3 was graded with soil and sand; oil seepage control operations were initiated utilizing drainage and interceptor trenches, weir/inverted pipe arrangements, sorbent pads and oil booms; and a six foot chain link fence was erected around the site to reduce the direct contact threat during remedial activities.

In 1980, the site property was transferred from Kenneth Peirce to Steven Wood and Charles Lawrence, residents of Moira.

Current response actions being funded by the USEPA to prevent PCB-contaminated oil from entering the wetlands area involve, periodic collection of contaminated surface oil in the drainage trench at the site proper and the changing of oil sorbent pads.

CURRENT SITE STATUS

Through a Coopertive Agreement with the USEPA, the NYSDEC completed an RI/FS for the York Oil site through its contractor, Erdman, Anthony, Associates (EAA), and it was released for public comment in August 1985. Based upon the finding's presented in the RI/FS, a ROD was prepared, recommending source containment (i.e., perimeter leachate collection, deep groundwater drawdown wells, on-site leachate treatment and installation of a cap in accordance with RCRA). The ROD signing was postponed, however, due to a change in EPA policy which now requires pursuit of response actions that permanently destroy, treat or recycle wastes, rather than just contain them, and the failure of the RI/FS to adequately assess the extent of contamination at the site proper.

Following delays which were due to liability insurance problems in New York State, an addendum FS to further define the extent of contamination at the site proper and to evaluate alternatives that utilize permanent solutions and treatment technologies to the maximum extent practicable was initiated in December 1986. The addendum FS was completed by EAA and released for public comment in November 1987. The following is a brief summary of the types and concentrations of contaminants detected at the site.

The site presently consists of two above-ground steel storage tanks containing approximately 25,000 gallons of PCB-contaminated oil, one empty subsurface steel storage tank, one graded unlined lagoon, and two consolidated unlined lagoons forming a mound approximately twenty-five feet high, containing PCB-contaminated soils and sludges, temporarily capped with kiln dust and sand. Approximately 30,000 cubic yards of contaminated soil are present at the site and this volume is based on a cleanup level of 10 ppm for PCBs in soils. This level is derived based on the current New York State goal to cleanup uncontrolled PCB sites in residential areas to a level less than 10 ppm and on the USEPA Toxic Substances Control Act (TSCA) PCB Spill Clean-Up Policy which states that PCB spills in residential areas be cleaned-up to 10 ppm.

The RI/FS indicates that the primary contaminants at the site are PCBs (maximum concentration of 230 ppm), heavy metals, including copper, lead (maximum concentration of 16,000 ppm) and zinc, volatile organics and total phenolics. These contaminants have been detected in oils in tanks, soils/sediments, surface waters and groundwater monitoring wells. A list of compounds detected in groundwater monitoring wells and surface water at the site proper that exceed their respective applicable or relevant and appropriate requirements (ARARs) and/or other criteria/ guidance to be considered are listed in Tables 1 and 2, respectively. Residential wells currently in use have not been impacted by the site. Table 3 lists the range of concentrations of compounds detected in soils/ sediments along with their frequency of detection.

Air quality monitoring conducted during the RI/FS was performed to assess baseline concentrations of hazardous materials in the air, to characterize air-borne contaminants released during drilling activities, and to assess requirements for worker health and safety. The analytical results reveal no elevated background concentrations of hazardous materials in the air. It is, therefore, unlikely that airborne contamination is a primary machanism for migration of contaminants.

The contaminant pathways from the site are primarily through surface water as overland flow to drainage paths and low lying areas, and through the groundwater, either as dissolved or floating contaminants, depending on their chemical nature. The extent surface water contamination, based upon oil and sediment analysis for PCBs, is widespread. Oil was observed floating in a drainage trench over two miles downstream of the site. Sediments from these locations have measureable PCB concentrations indicating the liklihood that oil from the site migrated in these surface waters for long distances, and have probably discharged to Lawrence Brook. The contamination pathway RI/FS will more accurately define the contamination in these areas.

PCBs tend to be in higher concentrations in lower lagoon #3, in the floating oil layer beneath the mound (lagoon #1 and #2) and in oils that have migrated via overland flow from the site. The highest level of PCBs in soil/ sediments is located in the adjacent 1000 ft x 200 ft strip of land west of the site at 210 ppm. Even though this area has been previously cleaned, migration of PCBs from

Table 1

GROUNDWATER MONITORING WELL COMPOUNDS EXCEEDING ARARS AND/OR OTHER CRITERIA/GUIDANCE TO BE CONSIDERED

Compound	Freq.(1)	Range of Concen. in Detected Samples (ppb)	Standard/Guideline (ppb)	Source(2)
Arsenic	9/16	2-110	25/0	703.5/CWA
Benzene	1/20	68	ND/0	703.5/RMCL
Cadmium	1/16	14	10/0	MCL/CWA
Chromium	4/16	70-950	50/50	MCL/CWA
Copper	9/16	28-920	200/1000	170.4/703.5
2,4 Dimethyl phenol	1/9	260	1/50 & 100(3)	703.5/*
Lead	9/16	66-15,000	25/50	703.5/CWA
Nickel	9/16	42-940	-/15.4	-/CWA
Phenol	1/9	2,000	1/50 & 100(3)	703.5/*
Total Phenolics	7/9	7-3,420	1/50 & 100(3)	703.5/*
Polychlorinated Biphenyl (PCB)	10/27	1-26,900(4)	.1/0	703.5/CWA
Trans- 1-2 Dichloroethene	6/20	90-2,000	-/50 & 100	-/*
Xylene	1/20	210	-/50 & 100	-/*
Zinc	16/16	68-2,500	300/5,000	170.4/CWA

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(1) Frequency is the number of positive observations divided by the number of samples analyzed. Does not include duplicates, blanks or matrix spikes.

(2) Sources for enforceable standards are as follows:
•703.5- NYS Water Quality Regulations- Standards for groundwater
•170.4- NYS Sources of Water Supply- Standards of raw water quality
•MCL- EPA National Primary Drinking Water Regulations- Maximum Contaminant Levels
Sources for the guidelines are as follows:
•CWA- Clean Water Act Water Quality Criteria
•RMCL- EPA Recommended Maximum Contaminant Levels
•143.3- EPA National Secondary Drinking Water Regulations- Secondary MCLs
* -The NYS ambient water quality guideline is 50 ppb for any single organic compound or 100 ppb for the total of designated organic compounds.

(3) The New York State groundwater standard for phenols is 1 ppb, however, this is a secondary standard for aesthetic purposes only. For this site, the NYSDOH has advised that the NYS ambient water quality guideline of 50/100 ppb be utilized.

(4) PCBs are concentrated in the floating oil layer in the shallow water table, however, they are reported here as being present in the groundwater.

Table 2

SURFACE WATER COMPOUNDS EXCEEDING ARARS AND/OR OTHER CRITERIA/GUIDANCE TO BE CONSIDERED

Compound	Frequency (%) (1)	Maximum Concen. in Detected Samples (ppb)	Criteria (2) (ppb)
Arsenic	100	4	0
Lead	100	5,900	50
Nickel	100	430	15.4
Polychlorinated Biphenyls (PCB)	100	120,000	.013

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(1) Frequency is the number of positive observations divided by the number of samples analyzed times 100. Does not include duplicates, blanks or matrix spikes.

(2) Water Quality Criteria (WQC)- Established under the Clean Water Act as non-regulatory criteria to protect human health from exposure to contaminated water, fish, and fish products, as well as to protect aquatic life.

ND - Analyzed but not detected.

TABLE 1

SUMMARY OF SOIL /SEDIMENT DATA

Compound	Frequency	Range of Concentrations in Detected Samples (ppm)
Acenaphthylene	2/10	1.25 - 2.0
Acetone	1/13	1.6*
Arsenic	7/11	2.5 - 8.2
Barium	1/6	2.2*
Benzene	4/13	0.70 - 9.4
Bis (2-ethylhexyl) Phthalate	2/10	7.0 - 25
Cadmium	4/11	0.28 - 22
Chloroform	1/13	1.5*
Chromium	10/11	2.4 - 79
Copper	9/11	3.7 - 290
Dibromochloromethane	1/13	1.9*
1,2 Dichlorobenzene	3/10	0.82 - 6.5
Ethylbenzene	5/13	0.85 - 74
Fluorene	4/10	1.5 - 3.4
Lead	10/11	4.8 - 16,300
Mercury	7/11	0.004 - 0.064
Methyl ethyl ketone	1/13	8.3*
2-methyl napthalene	3/5	18 - 62
4-methyl-2-pentanone	1/13	3.5*
Methylene Chloride	5/13	0.096 - 26
Naphthalene	5/16	7.7 - 64
Nickel	8/11	3.5 - 18
Pentachlorophenol	2/10	5.4 - 7.1
Phenanthrene	4/10	3.3 - 8.8
Phenol	2/10	2.7 - 3.2
Polychlorinated Biphenyls (PCBs)	46/106	0.1 - 210
Pyrene	1/10	1.1*
Silver	1/11	0.52*
Tetrachroroethylene	7/13	0.0093 - 84
Toluene	5/13	1.2 - 180
Trans-1,2 dichloroethene	3/13	0.33 - 6.2
1,1,1 Trichloroethane	2/13	0.44 - 1.1
Trichloroethylene	8/13	0.13 - 150
Xylene	6/13	0.026 - 510
Zinc	11/11	3,1 - 2,520

* - One sample with compound detected.

Frequency: Number of positive observations divided by the number of samples analyzed. Does not include duplicates, blanks or matrix spikes.

the site into this area continues to occur. Of the total estimated 30,000 cubic yards of contaminated soils/sediments, approximately 8,000 cubic yards is attributible to this area.

The second primary contaminant pathway from the site is through the groundwater. Soluble and insoluble contaminants at the site are migrating through the groundwater. Insoluble or floating contaminants (PCB-laden oil and volatile organics) were detected in the shallow water table monitoring wells and well points. The contaminant plume is concentrated around former lagoon #3 and is moving and spreading southwards towards the drainage trench along the abandoned railroad grade and the southern wetlands. As noted in Table 1, PCBs are reported as being present in the groundwater, however, they are concentrated in the floating oil layer in the shallow water table. PCBs were not detected in the deep monitoring wells screened in bedrock.

The water soluble contaminants (total phenolics) are migrating southward. As they migrate, they tend to sink into the deeper groundwater sources. The phenolics plume is the only deep plume exceeding an ARAR. The New York State groundwater standard for phenols is 1 ppb, however, this is a secondary standard for aesthetic purposes only. For this site, the New York State Department of Health (NYSDOH) has advised that for phenols, the NYS ambient water quality guideline of 50 ppb for any single phenolic compound or 100 ppb for the total of phenolic compounds be utilized.

RISK ASSESSMENT

The health risk assessment conducted in the FS evaluates potential risks associated with threatened or actual exposure at the York Oil site. This baseline risk assessment evaluates the possible impacts of site conditions on human health under baseline conditions of a projected no-action remedial alternative.

Since there is a contamination pathway RI/FS underway at the site to evaluate the potential contaminant pathway impacts, the following risk assessment is based upon site proper environmental data only. Using maximum concentrations observed for each environmental media (i.e., groundwater, surface water and soils), the risks associated with a "worst case" scenario are presented. The findings of the contamination pathway RI will permit the computation of a more likely scenario based on actual contaminant concentrations at the point of exposure.

The health risk assessment for the York Oil site has identified and analyzed potential health risks posed by the presence of hazardous chemicals at the site. A brief summary of the process used in this anaysis is presented below.

A characterization of contaminant sources was prepared based on both the data collected in the field study portion of the current study and on the results of past studies. A selection process was then developed and implemented to choose indicator compounds for the detailed toxicological and risk evaluations. Indicator compounds were chosen using criteria which eliminated from consideration those chemicals whose presence at the site did not significantly contribute to the hazard posed.

Potential receptor populations were identified, where possible, and screened based on assumed exposure pathways. Exposure levels for pathways which passed the screening process were estimated for the most sensitive identified receptors. Exposure levels were calculated using a number of assumptions regarding the absorption of the contaminant and the frequency of exposures. Risk levels were then calculated for each exposure pathway under the worst case scenario. The scenario chosen was conservative in nature, and it was developed using assumptions which may overestimate risks.

Risks Under Present Conditions

Risk calculations were undertaken for each of the screened exposure pathways considered possible under current conditions.

All evaluated site pathways were identified as potentially posing risks under a "worst case" scenario. Based on estimated non-carcinogenic hazard indices and cancer risk estimates, the relative significance of impacts of pathways is as follows:

- groundwater consumption as drinking water;
- direct contact with surface water;
- accidental ingestion of soils;
- accidental ingestion of surface water; and
- direct contact with soils.

In summary, this indicates that PCBs and lead pose the greatest hazard associated with soils and surface water ingestion and dermal absorption. The major hazard associated with ingesting groundwater is due to the presence of PCBs, cadmium, lead, arsenic and benzene. Therefore, contamination leaving the site proper in its present condition would not provide adequate protection of human health and the environment.

Response Requirements

Based on the results of the health risk assessment, in order to provide site control, the following actions should be addressed:

1. Surface water infiltration should be reduced.
2. Contaminated surface-water runoff should be eliminated.
3. Contaminated waste oils contained in the tanks, and oil migrating to the south on top of the water table should be collected and detoxified.
4. On-site contaminated soils and sludge should be collected and detoxified.
5. Deeper plumes of phenols migrating to the south should be collected and detoxified.
6. Contaminated surface sediments and soils in the 1000 ft x 200 ft strip of land should be collected and detoxified.

ENFORCEMENT

The USEPA has idetified three potentially responsible parties (PRPs) for the York Oil site at this time. These PRPs were sent notice letters prior to the initiation of the 1985 RI/FS. Following negotiations, the PRPs were not willing to conduct the required work. On December 9, 1983, the United States brought a civil action under Section 104 and 107 of CERCLA, seeking recovery of past and future monies expended for response activities at the site. The suit was filed against Kenneth Peirce (former owner of the York Oil Company), the Aluminum Company of America (ALCOA), and the Reynolds Metals Company. Upon the completion of the 1985 RI/FS, the PRPs were sent notice letters informing them of, among other things, their potential liability at the site, the availability of the 1985 RI/FS report and the close of the public comment period.

In November 1987, the USEPA provided the PRPs with the addendum FS and notified them of the preferred remedial action for the site as well as the close of the public comment period.

The USEPA intends to send notice to the PRPs upon approval of the ROD.

COMMUNITY RELATIONS

Various public informational meetings have been conducted and fact sheets have been distributed throughout the site's NPL history to inform the community of the remediation process. The draft 1985 RI/FS was made available for public review and comment on August 22, 1985, at the following locations: Moira Town Hall, the NYSDEC Region 5 Office, and the Franklin County Office of Emergency Preparedness. The public was notified of the RI/FS availability by public notice which were mailed to thirteen homeowners in the immediate area, and by press releases which appeared in the Watertown Daily Times and the Massena Observer. Following a request for extension of the twenty-one day public comment period by the PRPs, the comment period was extended an additional 30 days to October 11, 1985. A public meeting was held on August 28, 1985 at the Moira Town Hall which was attended by the NYSDEC, USEPA, Association of Concerned Citizens of Moira, elected officials, the press, and area residents.

Following USEPA's decision to conduct an addendum FS to further evaluate permanent remedies and better define the extent of contamination, local citizens were notified by mail of this proposed additional investigation and the concurrent investigations that would be conducted for the contamination pathways. The draft addendum FS was released for public comment on November 27, 1987, followed by the release of the proposed remedial action plan for the site. The public was notified of the addendum FS availability by public notice which were mailed to the thrirteen homeowners and by press release which appeared in the Malone Telegram.

The public repositories for the Administrative Record, which includes the addendum FS, are the Moira Town Hall, the NYSDEC Region 5 Office in Ray Brook, New York and the USEPA Region 2 Office in New York City. The NYSDEC and USEPA held a public meeting on December 16, 1987 to discuss the addendum FS and the proposed plans. The comment period was scheduled to end on December 18, 1987, however, in response to a request by the PRPs, the comment period was extended until January 15, 1988.

A summary of the comments raised concerning the RI/FS and public meeting are contained in the attached responsiveness summary. The local community prefers a permanent remedy for the site. The responsiveness summary also includes a copy of the press release announcing the meeting and an attendance list for the public meeting.

A transcript of the public meeting was kept in accordance with Section 117(a)(2) of CERCLA and is available to the public at the above-mentioned Administrative Record repositories.

ALTERNATIVES EVALUATION

The remedial alternatives for the York Oil site were developed and evaluated using CERCLA as amended, the NCP 40 CFR §300.68, "Guidance on Feasibility Studies Under CERCLA" and EPA's Interim Guidance on Selection of Remedy (December 24, 1986 and July 24, 1987) as guidance.

The major objective of the FS is to evaluate remedial alternatives using a cost-effective approach consistent with the goals and objectives of CERCLA. According to Section 121 of CERCLA, the recommended remedial alternative should protect human health and the environment, should be cost-effective, and should utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The proposed remedy must also attain ARARs that have been identified for the site. Section 300.68(e) of the NCP and Section 121(b)(1)(A-G) of CERCLA outline procedures and criteria which were used in evaluating and selecting the appropriate remedy for the site.

A five step process was developed and used to meet the FS objectives. The following is a summary of that process.

The first step is to evaluate human health and environmental effects associated with releases and threatened releases of hazardous substances from the site. Criteria to be considered are outlined in Section 300.68(e) of the NCP and include such factors as actual or potential direct contact with hazardous material, degree of contamination of drinking water, and extent of isolation and/or migration of the contaminants.

. . .

The next step is to develop a range of potential available remedial technologies that could be used to remediate the site. Section 121(b) of CERCLA requires that remedial technologies in which treatment permanently and significantly reduces the toxicity, mobility or volume of the hazardous substances as a principal element, are to be preferred over remedial technologies not involving such treatment. These technologies are initially screened on a technical basis. Based on the screening, a list of individual remedial technologies appropriate to site conditions and consistent with the remedial action objectives is developed.

The site-appropriate remedial technologies are then combined into a number of preliminary remedial alternatives. The basis for the various combinations are: the technical and logical interrelationship between separate technologies; NCP Section 300.68(f) requirements that generel categories of alternatives must be considered and CERCLA Section 121 provisions regarding the preference for remedial actions that utilize permanent solutions and alternative treatment or resource recovery technologies. USEPA is in the process of revising the NCP to reflect these new provisions added by CERCLA. USEPA's "Interim Guidance on Superfund Selection of Remedy" (December 24, 1986 and July 24, 1987) is intended to aid the Agency in the selection of remedial actions pending USEPA's upcoming revisions of the NCP. This summary reflects that guidance. USEPA's interim guidance requires analysis of alternatives involving: 1)treatment options with different degrees of long-term management; 2)containment of waste option with little or no treatment, but providing protection of human health and the environment primarily by preventing exposure or reducing the mobility of the waste and 3)the no-action alternative. In most circumstances, these three categories of alternatives must be carried through the detailed evaluation process, and should not be eliminated during previous screening processes.

The fourth step in the process is to provide an initial screening of these alternatives as delineated in Section 300.68(g) of the NCP. The three broad criteria that should be utilized in the screening are: the relative effectiveness in minimizing threats; the engineering feasibility and implementability of the alternatives and the cost of implementing the remedial action. This general screening is intended primarily to reduce the number of remedial alternatives which will subsequently be evaluated in detail.

The final step as outlined in Section 300.68(h) of the NCP is to conduct a detailed analysis of the limited number of alternatives that remain after the initial screening. In most circumstances, a range of treatment alternatives, a containment and no-action alternative should be included in this analysis. These alternatives are then evaluated using evaluation criteria derived from the NCP and CERCLA. These criteria relate directly to factors mandated by CERCLA in Section 121 including Section 121(b)(1)(A-G) and EPA's Interim Guidance on Selection of Remedy (December 24, 1986 and July 24, 1987). The criteria are as follows:

- Compliance with legally applicable or relevant and appropriate requirements (ARARs)
- Reduction of toxicity, mobility or volume
- Short-term effectiveness
- Long-term effectiveness and permanence
- Implementability
- Cost
- State acceptance
- Community acceptance
- Protection of human health and the environment

DEVELOPMENT OF ALTERNATIVES AND INITIAL SCREENING

Source control remedial responses for the York Oil site will address contamination of the site proper. A further definition of the extent of contaminant migration from the site is currently being assessed in a contamination pathway RI/FS.

The objective of the proposed source control remedial action is to prevent further contaminant migration from the site and thus minimize the threat to human health and the environment. Criteria established to obtain this objective are:

- Eliminate the potential for human/animal direct contact with site wastes;
- Eliminate the migration of PCB-contaminated oils and other contaminants through surface and groundwaters; and
- Eliminate the potential for precipitation/infiltration with the wastes.

Source control technologies that are not considered appropriate for utilization at the York Oil site and a brief discussion of the reasons for their exclusion are lsited in Table 4.

Table 5 lists and briefly describes the technically appropriate remedial technologies for the York Oil site. These technologies were accepted on the basis that they are compatible with the specific site conditions and the remedial action objectives for this operable unit. These technologies were then combined into source control alternatives. As a result, nine remedial action alternatives were developed for evaluation.

Table 4

INAPPROPRIATE REMEDIAL TECHNOLOGIES

- Grout injection - Best suited for sealing voids in rocks, rather than for containing groundwater flow in unconsolidated materials around the site. The compatibility of most grouts with hazardous waste and leachate has not been determined. Slurry walls are less costly and have lower permeabilities than grouted barriers. In addition, the variability of the permeabilites of the soils at the site are not considered suitable for grouting.

- Steel or wood piling cut-off wall - Wood is an ineffective groundwater barrier, and steel barriers are rejected as a containment response on the basis that the pilings cannot be driven into rocky soil with boulders. The boulders encountered within the overburden and the boulder/cobble layer at the York Oil site would damage the piles, rendering the cut-off wall ineffective.

- In-situ solidification - Varying permeabilities at the site limit complete interaction of the fixation additives and the contaminants in the soil.

- Soil flushing - Flushing the soil with solvents or surfactants will create problems with surfactant recovery. Steam enhanced oil recovery is ineffective since the confining pressures of the site overburden is not great enough to contain the steam.

- Oxidation - Inappropriate due to violent reactions between oxidant (e.g., ozone) and metals, oxidation of non-target compounds which may lead to changes in soil hydraulic conductivity, and partial oxidation of target compounds resulting in more mobile and/or more toxic by-products.

- In-situ chemical dechlorination - Due to the non-uniform distribution of PCBs in the soils, complete mixing of the reagents and PCBs utilizing in-situ treatment would not occur. It is also limited due to the higher moisture content in the soil/sludge layer.

Table 5
APPROPRIATE REMEDIAL TECHNOLOGIES

- Slurry wall - Would be keyed into the intact glacial till layer at a depth of about 35 feet, and would physically contain the site. The slurry wall would be installed around the site perimeter to prevent the entry of clean groundwater into a leachate collection drain.

- French drain - It is designed to collect contaminated groundwater and oil in the overburden and transport it to a treatment facility. The inclusion of a hydraulic barrier on the outer portion of the drain is intended to reduce the amount of clean groundwater entering the drain.

- Drawdown wells - Shallow wells would collect contaminants in the overburden and oil layer and deeper wells would collect the phenolics plume. The collected groundwater would be piped to a treatment facility at the site.

- On-site storage tanks - During remedial response, temporary storage tanks could be utilized for storage of oil and soils and permanent tanks could be utilized for a proposed water treatment facility at the site.

- Water treatment system - It is essential for the cleanup of contaminants in the groundwater. Groundwater would first pass through an oil/water separator whereby oils would be set aside for PCB-treatment. The water could then be treated with an activated carbon filter to remove organics and a deionizer to remove heavy metals.

- Surface sealing - If the site is contained, surface sealing utilizing clays, bentonite, cement and membrane liners helps to prevent direct contact and reduces infiltration and leachate generation. If hazardous wastes are left on-site, the surface seal must comply with Section 264.310 requirements of RCRA.

- Excavation of wastes - Would remove all source contaminants, (approximately 30,000 cubic yards of soil) except the deep phenolics plume, thus eliminating further migration from the site. A shallow well dewatering system would be required to control groundwater in the mound during excavation.

- Off-site disposal of wastes - Aside from the fact that landfills do not reduce the toxicity or volume of the contaminants and the future fate of these wastes are not certain, off-site disposal in a PCB-permitted landfill is a technically feasible technology.

Table 5 - continued

- Chemical dechlorination - Dechlorination of PCB-contaminated soils and oils in an off-site facility and in a slurry mode following excavation, is a feasibile technology, however, volatile organics and metals would still be present in the waste.

- Biological treatment - It is a viable treatment method for the contaminated wastes at the site and could only be performed in a slurry mode, following excavation. The microorganisms are sensitive to low temperatures, however, covered and heated tanks could provide optimal conditions. Most microbes identified are not capable of degrading highly chlorinated PCBs.

- Solidification - Following excavation, on-site slurry mode solidification provides permanent immobilization of the soils at the site. The toxicity and mobility of the wastes is reduced resulting in a non-leachable solidified soil matrix.

- Thermal treatment - The waste would be excavated, then thermally treated on-site. This process would destroy both PCBs and organics, however, the fate of the metals is questionable. Further treatment of the ash may, therefore, be required. Thermal treatment must comply with RCRA Section 264 Subpart O and TSCA Section 761.70 incineration requirements.

The nine remedial alternatives have been subjected to an initial screening consistent with 40 CFR Section 300.68(g)(1), (2) and (3) of the NCP to narrow the list of potential remedial actions for further detailed analysis. This screening concluded that the excavation and off-site disposal option of the wastes in a PCB-permitted landfill is not as effective in minimizing threats to human health and the environment as containing the wastes on-site. On-site containment does not require excavation and transport of the wastes thereby providing significantly fewer environmental risks than off-site landfilling. Also the implementability difficulties and significantly higher cost for landfilling is a major factor in eliminating this option from further consideration.

The other remedial option that is eliminatd from further evaluation is the excavation of the soils followed by either on-site or off-site chemical dechlorination of these soils and oils in a slurry mode. The public health and environmental problems with the excavation and transport of the soils has been discussed above. In addition, dechlorination (either on-site or off-site) only addresses the PCBs and would not affect the volatile organics and heavy metals. This would only result in some reduction of the toxicity of the waste, however, there would be no change in either the mobility or volume of wastes. Other treatment options (solidification, thermal and biological treatment) provide better effectiveness in minimizing threats.

DETAILED EVALUATION OF ALTERNATIVES

As a result of the screening process, a total of seven remedial action alternatives were developed for detailed comparative evaluation at the York Oil site. Three containment options, three treatment options and the no-action alternative were carried through to this step. These seven feasible remedial alternatives, and their associated capital costs, operation and maintenance present worth costs and total present worth costs are provided in Table 6. This table also provides the estimated time to implement each remedial alternative from the completion of the ROD, and the time it takes until full protection is achieved.

Description of Alternatives

This section provides a brief description of the seven feasible remedial alternatives. A more detailed description of the alternatives can be found in the addendum FS.

Table 6

Remedial Alternatives Summary

lternative Number	Components	Total Costs ($ x 10^6) Capital	O & M	Present Worth	Time to Implement from ROD	Time Until Full Protect. Is Achieved	Comments
1	No Action with Site Monitoring	0.3	1.1	1.3	6 mo.	Undetermined	Will not protect human health and environment.
TAINMENT OPTIONS							
	Perimeter Slurry Wall, Interior Perimeter Drain, Lateral Drains Extending into Fill, Treatment of Collected Groundwater, Off-Site Thermal Treatment of Tank Oils, Cleaning and Demolition of Tanks, and an Impermeable Cap in Accordance with RCRA	5.1	1.7	6.8	3 yrs.	15 yrs.	Physically contains the site but does not capture deep plume (Doesn't meet ARARs). Boulders limit excav.
3	French Drain with Hydraulic Barrier Around the Site Except for Northwest Portion, Lateral Drains Extending into Fill, Deep Drawdown Wells, Treatment of Collected Groundwater, Off-Site Thermal Treatment of Tank Oils, Cleaning and Demolition of Tanks, and an Impermeable Cap in Accordance with RCRA	4.2	1.9	6.1	3 yrs.	15 yrs.	Hydraulically contains the site, however, drain provides limited oil recovery. High long-term O&M requirements.
4	Shallow and Deep Drawdown Well System, Treatment of Collected Groundwater, Off-Site Thermal Treatment of Tank Oils, Cleaning and Demolition of Tanks and an Impermeable Cap in Accordance with RCRA	2.3	1.8	4.1	3 yrs.	15 yrs.	Hydraulically contains shallow & deep plumes. Pumps collect excess amounts of clean water O&M intensive.
REATMENT OPTIONS							
5A	Soil Excavation, On-Site Thermal Treatment of Soils and Tank Oils, Deep Drawdown Wells, Treatment of Collected Groundwater, Cleaning and Demolition of Tanks, On-Site Disposal of Residual Ash, and Surface Grading	15.0	0.5	15.5	3 yrs.	5 yrs.	Reduces toxicity and mobility. Destroys PCB and organics. Metals may inhibit process. Further treatment of ash may be required.
5B	Soil Excavation, On-Site Biological Degradation of Soils and Tank Oils, Deep Drawdown Wells, Treatment of Collected Groundwater, Cleaning and Demolition of Tanks, On-Site Disposal of Treated Soil, and Surface Grading	13.0	0.5	13.5	3 yrs.	5 yrs.	Degrades most PCBs and organics but ineffective in degrading high chlorinated biphenyls.
5C*	Soil Excavation, On-Site Solidification of Soils, Thermal Treatment of Oils, Deep Drawdown Wells, Treatment of Contaminated Groundwater, Cleaning and Demolition of Tanks, On-Site Disposal of Solidif[illegible] Soil and Surface Grading	6.5	0.5	7.0	3 yrs.	5 yrs.	Reduces toxicity and mobility. Permanently immobilizes the waste. Protects human health & environmen[illegible]ow O&M

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ferred Remedial Alternative.

Alternative 1 - No-Action with Site Monitoring - This alternative consists of allowing the site to remain in its existing condition and maintaining the current containment system. The present containment system consists of an interceptor ditch that runs along the northwest border of the site and a filter fence located in a seep area south of the lagoon #3. The existing containment system and existing conditions were previously shown on Figure 2. The ditch collects surface runoff and intercepts groundwater during periods of high groundwater. The filter fence collects oils migrating southwards from lagoon #3.

A long-term groundwater monitoring program would be initiated with the no-action alternative and each of the other six options, to allow periodic reassessment of human health and environmental risks posed by the site. The monitoring would incorporate the installation of approximately 15 wells at five locations. Each well cluster would consist of at least 3 points, screened in the overburden, cobble layer and bedrock. The exact location of the wells would be a function of the selected alternative. In general, 2 to 3 well clusters would be located downgradient along the south side of the site and 1 to 2 well clusters would be located upgradient in the northwest and northeast corners of the site. The sampling would occur on a quarterly basis and would include groundwater, surface sediments in the wetlands, and for the no-action alternative, oils collected in the interceptor ditch. Table 7 summarizes the proposed long-term monitoring program at the site.

Alternative 2 - Slurry Wall with Interior Drain, Groundwater Treatment, Thermal Treatment of Oils, and an Impermeable Cap

The perimeter slurry wall would be keyed 5 feet into the intact glacial till layer at a depth of about 35 feet, and would physically contain the on-site contaminants. An interior drain would be placed around the site perimeter inside the slurry wall at a depth of approximately six to seven feet with lateral drains extending into the fill. This drain system would partially protect the slurry wall from migrating oils which could possibly erode the wall, reduce the occurrence of oil and groundwater overtopping the slurry wall by draining the groundwater mound into a sump, and provide the necessary inward groundwater gradient. The drainage would then be pumped into an oil/water separator and water treatment system along with oils collected from the on-site storage tanks.

Table 7 - Long-Term Monitoring Program

Groundwater Monitoring

Existing Wells:
Y01R
Y06
Y07(S)
Y07(D)
Y09
Y09A
Y012 (3 clusters)
Y014 (3 clusters)
Y027(D)

Proposed Wells:
Y0101 (3 clusters)
Y0102 (3 clusters)
Y0103 (3 clusters)
Y0104 (3 clusters)
Y0105 (3 clusters)

Parameters:
phenolics
volatile organics
PCBs
oil and grease
zinc
lead

Wetland's Monitoring

3 sediment samples in drainage swale

Parameters:
PCBs

Oils collected from the on-site tanks and groundwater would be thermally treated off-site. The contaminated water would be treated by carbon adsorption and deionizer units and discharged into the surrounding wetlands or injected into the ground. The PCB-laden sediments would be collected from the adjacent strip of land and placed on-site within the slurry wall for containment. An impermeable RCRA cap would be constructed over the contaminated on-site area as a component of this alternative. The monitoring program outlined for Alternative No. 1 would also be incorporated with this alternative, in addition to cleaning and demolition of the on-site tanks.

Alternative 3 - French Drain with Hydraulic Barrier, Deep Drawdown Wells, Groundwater Treatment, Thermal Treatment of Oils, and an Impermeable Cap

With this alternative, a french drain would encircle the site, with lateral drains extending into the fill. The proposed drain, which would lower the water table and collect migrating oils, would be placed at a depth of approximately 15 to 20 feet in the down-gradient (southern) area of the site. The north, or up-gradient drain would be placed approximately 3 to 5 feet below the ground to control the level of the water table. The hydraulic barrier, on the outside of the french drain serves to limit the amount of clean groundwater entering the system, thus reducing treatment quantities and costs. The barrier would also prevent migration of any contaminants through the drain.

Another component of this alternative is the addition of approximately 20 deep drawdown wells places along the south, east, and west sides of the site. These wells would be pumped for three years to collect the phenolics within the weathered till and cobble/boulder layer located beneath the french drain. If, after three years, the phenolic plume is cleaned-up to a level tht satisfies the ARARs (50 ppb for any single phenolic compound and 100 ppb for total phenolics), the deep wells would then be used for monitoring only.

Groundwater and oil collected in the french drain and wells would be stored, treated, and disposed of using the oil/water separator, water treatment system, and off-site thermal treatment as outlined under Alternative No. 2. The tanks would be cleaned and demolished as discussed in the previous option.

The PCB-laden sediments would be collectd from the 1000 ft. x 200 ft. strip of land and placed on-site within the limits of the french drain for containment. An impermeable RCRA cap would be constructed over the contaminated on-site areas.

Alternative 4 - Drawdown Well System, Groundwater Treatment, Thermal Treatment of Oils, and an Impermeable Cap

The system of drawdown wells would consist of 29 shallow wells and 23 deep wells set above the till layer. The shallow wells would be installed up to twenty feet deep and would be constructed of 2-inch diameter stainless steel. This system of wells would be connected to a manifold and would be pumped by a series of 3 suction pumps. The deep wells would be set on top of or extend up to 5 feet into the till layer, which is approximately 35-40 feet deep. Each deep well would be constructed of 6-inch diameter stainless steel and each would have an individual submersible pump. As with the french drain alternative, the deep wells would be pumped for the first three years to collect the phenolics plume, and then used for monitoring.

As with the slurry wall and french drain alternatives, this system would be coupled with an oil/water separator and water treatment system. Recovered oil would be treated off-site using thermal treatment as outlined in Alternative #2 and 3. The contaminated sediments would be collected from the strip of land and placed on-site within the drawdown well zone of influence for containment. An impermeable cap would be constructed in accordance with RCRA over the on-site contaminated area. The long-term groundwater monitoring program would also be incorporated with this alternative. The PCB-laden sediments would be collected from the 1000 ft x 200 ft strip of land and placed on-site within the limits of the french drain for containment. An impermeable RCRA cap would be constructed over the contaminated on-site area.

Alternative 5A - Soil Excavation, On-Site Thermal Treatment of Soils and Tank Oils, Deep Drawdown Wells, Groundwater Treatment, On-Site Disposal of Ash and Surface Grading

For this alternative, an estimated 30,000 cubic yards of contaminated soils and sludges would have to be excavated from the site. This volume would include approximately 8,000 cubic yards of material from the 1000 ft x 200 ft strip of land west of the site. All the excavated material in addition to the contaminated oils would be treated using an on-site thermal treatment unit. The mobile unit would destroy PCBs and organics and achieve 99.9999% destruction and removal efficiency. The aim of thermal treatment would be to render the treated soils into a non-hazardous form. The treated material would then be disposed of on-site, and graded. Due to the metal- contamination in the soil, the residuals from thermal treatment may need to be solidified/stabilized before disposal on-site. A test burn would be preformed as a pilot test to determine the characteristics for thermal treatment applications.

For three years, deep drawdown wells would be pumped to collect the phenolics plume, and after that time they would be used for monitoring purposes. Temporary shallow drawdown wells would be utilized to collect migrating pollutants in addition to dewatering the mound to allow efficient excavation.

As is the case with all the alternatives, the collected groundwater would be treated and the tanks would be cleaned and demolished.

Alternative 5B - Soil Excavation, On-Site Biological Treatment of Soils and Oils, Deep Drawdown Wells, Groundwater Treatment, On-Site Disposal of Treated Soil and Surface Grading

As with Alternative 5A, under Alternative 5B, all contaminated soils would be excavated. However, Alternative 5B would then involve biological treatment of the soils in an on-site treatment unit. This process could not be applied in-situ due to the inability to assure complete mixing of the biological organisms and the contaminated media.

The biological treatment would be done in mixing tanks or lagoons constructed on-site. The microorganisms would be added to the excavated soils and nutrients and catalysts would be added as required to aid in the reaction. After treatment and testing, the detoxified soils would be returned to the site and graded. Oil within the storage tanks would be treated separately or added to the excavated soil for treatment.

During the remedial design, a treatability study would be conducted to determine the appropriate nutrients, catalysts, and reaction conditions. In addition, laboratory testing would be required to evaluate the leachability of metals from the treated soils.

A series of shallow wells would also be included during construction with this alternative to collect floating oils and to allow efficient excavation. Deep drawdown wells would also be necessary to collect the phenolics plume in the deeper groundwater zone.

As discussed previously, the groundwater would be treated in-site and the tanks would be cleaned and demolished.

Alternative 5C - Soil Excavation, On-Site Solidification of Soils, Thermal Treatment of Oils, Deep Drawdown Wells, Groundwater Treatment, On-Site Disposal of Solidified Soils and Surface Grading

Alternative 5C involves the solidification/fixation of contaminated soils and sludges. The contaminated soil and sludge in the 1000 ft by 200 ft strip of land as well as the contaminated soils within the fenced area would be excavated and dewatered prior to treatment. In-situ treatment is not feasible because of the highly permeable soils, therefore, resulting in incomplete mixing.

The solidification treatment would be performed in a mobile unit located on-site. The mobile unit would mix the fixing agents/additives, and would blend the waste in mixing tanks with the fixing additives, thereby permanently immobilizing the waste. The stabilized material would be tested to verify its non-leachability, followed by on-site disposal and grading.

A series of shallow wells would also be included with this alternative during construction to collect floating oils and to allow efficient excavation. The oils collected during excavation as well as the tank oils would be thermally treated off-site. Deep drawdown wells are also necessary to collect the groundwater plume within the boulder zone. The collected groundwater would be subsequently treated.

A treatability study during the design phase is recommended to determine the effectiveness of the fixing agents to permanently immobilize the entire waste stream.

Detailed Evaluation and Comparison of Alternatives

A detailed evaluation of each of the seven alternatives remaining after the initial screening was conducted consistent with 40 CFR Section 300.68(h) of the NCP. A comparative discussion of the seven alternatives using the evaluation criteria listed previously is summarized below.

- Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA requires that remedial actions comply with all applicable or relevant and appropriate Federal and State requirements (ARARs) to the extent that hazardous substances are present on-site.

Each of the seven alternatives would comply with ARARs, with the exception of the no-action. If the no-action alternative is selected, both surface and groundwater at the site would continue to exceed federal and state standards. The slurry wall option (Alternative 2) does not meet the State groundwater ARAR for phenols (i.e., 50 ppb for any single phenolic compound and 100 ppb for total phenolics), since the deep groundwater extraction wells are absent from this option. However, this alternative does comply with RCRA Part 264.310 requirements which specify certain thickness and composition for final covers at hazardous waste sites.

While permits are not required for on-site remedial actions at Superfund sites, any on-site action must meet the substantive technical requirements of the permit process. Thermal treatment of the oils at the site would comply with all the applicable federal requirements of Part 264 Subpart O of RCRA (Subpart O specifies design requirements for operation of hazardous waste incinerators) and Part 761.70 of TSCA which specifies requirements for incineration of PCBs. Specifically, operation of an on-site thermal treatment unit would require that the transportable unit undergo waste specific trial or demonstration burns to demonstrate satisfactory destruction of the toxic components of the waste. The trial or demonstration burn must show that the unit achieves 99.9999% destruction and removal efficiency (six 9s DRE), and controls air emissions of products of incomplete combustion, acid gases and particulates to specified levels.

Containment Alternatives 3 and 4 include deep pumping to collect the migrating phenolics plume and these options comply with the RCRA provisions regarding final covers.

The three treatment alternatives will comply with state and federal PCB-cleanup policies, requiring PCB cleanup in soils in residential areas to 10 ppm. (Even though these cleanup policies are not promulgated ARARs, they are consistently ulilized when developing cleanup levels for PCBs in residential areas.) These options also mitigate both the shallow and deep groundwater quality problems. Thermal and biological treatment and solidification are also consistent with the proposed NCP as permanent treatment remedies. The treatment options would comply with all federal and state requirements concerning potential air emissions (particulates and volatiles) during the excavation of contaminated soils and sludges.

The applicable New York State air requirements for excavation include Part 257 and Part 373, which regulate ambient air standards, and control of particulates from waste piles, respectively. The federal requirements to be complied with during excavation include 40 CFR Part 50 and Part 264.25(f), which control ambient air standards and control of particulates from waste piles, respectively.

The State applicable requirements include compliance with Part 212 which controls air emissions of contaminants to the outdoor atmosphere, Part 373-2.15 regulating operating standards for hazardous waste incineration and the State Air Guide-1 Guidance. All alternatives utilizing thermal treatment of oils would also comply with these requirements. However, if an off-site, out-of-state treatment facility is used for the oils, then the thermal treatment alternatiaves would comply with the applicable State requirements where the unit is located.

Each of the treatment options (Alternatives 5A, 5B, and 5C), which include the incorporation of deep wells, will meet the State groundwater standard for phenols.

Discharge of the treated groundwater into the wetlands would comply with the New York State Pollutant Discharge Elimination System requirements.

Consistent with CERCLA Section 121 requirements, the continued effectiveness of containment options 2, 3 and 4 would have to be evaluated at least every 5 years to assure continued protection of human health and the environment. The treatment options would also have to be evaluated every five years since this material would remain on-site.

•Reduction of Toxicity, Mobility or Volume

This evaluation criteria relates to the performance of a remedial alternative in terms of eliminating or controlling risks posed by the toxicity, mobility or volume of hazardous substances.

Solidification would permanently immobilize the soil/waste matrix, thereby eliminating any associated toxicity due to the contaminants. Any future leaching of contaminants from the solidified soil would also be eliminated by this option. Thermal and biological treatment of the soils would destroy the PCBs and organics, however, the toxicity associated with the heavy metals would remain unchanged.

The no-action alternative would not result in a reduction of either the toxicity, mobility or volume of the waste since the site would be left as is. The containment options (Alternative

2, 3 and 4) would result in some toxicity and mobility reduction due to the groundwater collection and treatment system, however, the volume of waste material would not be reduced. The volume of waste material would not be affecated by either thermal or biological treatment. With solidification, however, due to the addition of the fixation agents, the volume of waste material would likely increase, but not substantially.

•Short-Term Effectiveness

Short-term effectiveness measures how well an alternative is expected to perform, the time to implement the action, and the potential adverse impacts of its implementation.

The implementation of the no-action alternative causes no adverse impacts over the short-term, since the only short-term construction activities associated with this alternative is the installation of additional groundwater monitoring wells for long-term site monitoring. The estimated time to implement the no-action alternative is six months from the signing of the ROD.

Alternatives 2 and 3 require limited excavation of the soils, and the installation of a slurry wall and french drain, respectively. Excavation could result in short-term air emissions and installation difficulties due to large boulders at the site. Both alternatives provide limited recovery of contaminated oils due to the low porosity of the soils.

Alternative 4 provides a greater degree of protection over the short-term than Alternative 2 and 3 since only deep and shallow drawdown wells would be installed, thereby not requiring soil excavation. However, excessive amounts of clean groundwater would be collected and oil recovery via the pumping system would be limited. Installation of an impermeable cap (Alternatives 2, 3 and 4) would increase the short-term air emissions due to the necessity of grading the mound at the site.

The three treatment options (Alternatives 5A, 5B and 5C) require excavation, thereby increasing the short-term risk from air emissions. Thermal treatment may result in air emissions, however, as noted above, strict measures would be implemented to ensure that such emissions would not be harmful to human health and the environment. Alternative 5A may also require additional materials handling on-site, such as pretreatment (e.g., shredding and crushing) of the contaminated soils prior to feeding to the thermal treatment unit.

The time to implement each remedial option, except for the no-action, is approximately three years from the signing of the ROD.

°Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence addresses the long-term protection and reliability of an alternative.

Over the long-term, the on-site treatment options provide essentially equivalent protection to the local communtiy, since the residuals are not expected to pose a hazard from a health and environmental perspective. However, the long-term effectiveness of thermal treatment to destroy the organics and to fuse the high concentration of lead into the residual ash in a non-hazardous form is questionable at this time. Further treatment of the residual ash may, therefore, be required.

The residuals following thermal, biological and solidification treatment processes would be anlayzed to determine the effectiveness each treatment procedure has in rendering the material into a non-hazardous form. In addition, tests would be conducted to ensure that the residuals pose no direct contact risk.

Each alternative, except the no-action and slurry wall options, is designed to clean-up the deep phenolics groundwater contamination within three year of pumping.

The treatment options achieve full protection of human health and the environment, with minimal O&M, within five years from the signing of the ROD, while the containment options require a high degree of O&M and take approximately fifteen years to achieve full protection. Alternatives 2, 3 and 4 only contain the wastes while Alternatives 5A, 5B and 5C treat the wastes, resulting in a permanent remedy for the site. It is believed that Alternative 5C, solidification, would provide a higher degree of long-term effectiveness than biological treatment since solidification would permanently immobilize the waste. Biological treatment is not effective in degrading the highly chlorinded PCBs and metals. As mentioned above, further treatment of the residual ash following thermal destruction may be needed.

The containment options, once implemented, need to be evaluated every five years to ensure their continued effectiveness. This evaluation would determine the effectiveness of these options to lower the groundwater mound at the site and determine the continued effectiveness of the cap to reduce the direct contact threat.

The no-action alternative provides minimal long-term effectiveness since the wastes would remain at the site without any containment or treatment.

°Implementability

Implementability addresses how easy or difficult it would be to carry out a given alternative. This covers implementation from design through construction and O&M.

The implementability of the alternatives is evaluated in terms of technical and administrative feasibility, and availability of needed goods and services.

Each alternative evaluated here is technically feasible, however, each treatment option (Alternative 5A, 5B, and 5C) would require a treatability study to determine the optimal conditions to render the residuals into a non-hazaradous form. The treatability study would be conducted during the remedial design.

Full-scale operation of transportable thermal treatment units at hazardous waste sites has been limited. Units have also experienced extended periods of downtime, therefore, it is likely that operation of a unit at the York Oil site would also result in some extended downtime periods. However, in all situations, transportable units have been repairable and have been brought back up to full-scale operation.

The effectiveness of thermal treatment to fuse the metals in the residual ash without further treatment of this material has not been demonstrated at this time. Frequent monitoring of residuals during full-scale operations would be needed to ensure the systems's effectiveness and reliability.

Transportable units for thermal, biological and solidification are currently available for use at hazardous waste sites and could be used at York Oil. Sufficient area exist on-site to set-up these mobile treatment units for operation and there is ample land area available on-site for disposl of the treated soil.

Due to the severe and elongated winters in this area, the construction season for each alternative would be limited. These conditions might also result in hampered maintenance operations, especially with the groundwater collection component (pumps, drains) of the containment options. Due to the decreased winter temperatures, both solidification and biological treatment may require additional precautions (heated tanks) to maintain optimal reaction rates.

°Cost

Costs are evaluated in terms of capital, O&M and present worth.

In comparing treatment Alternatives 5A, 5B and 5C which result in the same degree of remediation (i.e., final end-product which does not pose a threat to human health and the environment), solidification of the soils has been identified as a cost-effective alternative. The present worth cost for these three options ranges from approximately $7 million for solidification to $15 million for thermal treatment. For thermal treatment of soils (Alternative 5A), if it is determined during the treatability study that further treatmeant of the residual ash is needed, an estimated additional $2 million could be required. The three treatmeant options include costs for excavation and treatment of approximately 30,000 cubic yards of contaminated soils.

The total present worth cost for the containment options (Alternatives 2, 3 and 4) vary from approximately $4 million to $7 million, but do not meet the preference for treatment. They do, however, reduce the exposure to the contaminants.

As mentioned previously, Table 6 provides a summary of the capital, O&M and total present worth cost for each of the seven alternatives. A more detailed breakdown of these costs are provided within the addendum FS.

°State Acceptance

This section addresses any concerns and degree of support the State has expressed regarding the remedial alternatives being evaluated.

The States supports a permanent solution for the York Oil site. Its preference is on-site thermal treatment of the contaminated soils and oils (Alternative 5A). The State's primary concern with this option is the ability or inability of the thermal treatment unit to render the high concentration of metals in the residual ash in a non-leachable form.

Alternative 5C includes on-site solidification of the soils and off-site thermal treatment of the oils. This option would permanently destroys the contaminants in the oils through thermal treatment and would immobilize the contaminated soils at the site. The State's concern regarding this option is whether the contaminants in the solidified soil would leach, therefore, not providing a permanent solution.

Prior to implementation of either of these options, a treatability study would be performed to answer the concerns mentioned above.

°Community Acceptance

This evaluation criteria addresses the degree to which members of the local community suport the remedial alternatives being evaluated.

Both the DEC's preferred option (Alternative 5A) and EPA's proposed remedial action plan (Alternative 5C) were made available during the public comment period and were presented at the public meeting. In general, the community indicated a preference for a permanent remedy at the site. Some residents expressed concern that solidification only contains the wastes and is not a permanent technology.

Concerns were also raised regarding the quality of the residential wells and the need for a residential water supply in the area of the site. Since all residential wells are free of any contamination attributable to the York Oil site, and the potential for future impact of residential wells is minimal due to the nature and movement of groundwater in the area, a residential water supply is not justified at this site.

Detailed responses to the community concerns are contained in the attached responsiveness summary.

°Protection of Human Health and the Environment

Protection of human health and the environment is the central mandate of CERCLA. Protection is achieved primarily by reducing health and environmental threats to acceptable levels and taking appropriate action to ensure that there will be no unacceptable risks to hemah health and the environment through any exposure pathways.

Except for the no-action alternative, all of the alternatives evaluated here are protective of human health and the environment to some degree. However, options 2, 3 and 4 only physically or hydraulically contain the contaminants at the site, thereby resulting in the potential for some continued migration of PCBs and other contaminants into the groundwater and surface water. Thermal treatment of the soils by itself (Alternative 5A) would not address the health risks associated with leaving heavy metal contamination in the residual ash, however, it would destroy the organic contaminants in the soils.

Appropriate measures would need to be taken during site excavation (Options 5A, 5B and 5C) to protect workers and the community. In addition, prior to implementing treatment under Alternatives 5A, 5B and 5C, measures would have to be taken to assure that implementation of these treatment processes does not pose a threat to human health or the environment. A few of the potential problems are outlined below.

Workers would be protected through measures outlined in project specific health and safety plans and through contractor adherence to Occupational Safety and Health Act (OSHA) regulations.

An on-site transportable thermal treatment unit and/or associated air pollution control equipment, materials handling equipment, or materials pretreatment equipment may generate noise during routine operation. However, proprietors of these units have indicated a willingness to house or insulate any noisy pieces of equipment or take any other measures necessary to eliminate the generation of noise.

Both solidification and biological treatment would not generate substantial noise during actual operations. However, noise from excavation equipment and any potential materials pretreatment would be generated. Again, measures could be taken to minimize noise generation.

Dust and particulate matter could be generated during materials handling pretreatment. The potential for air releases of products of incomplete combustion during thermal treatment, also exists. Measuares would be taken to reduce these potential hazards prior to full-scale operation.

Of the treatment options, solidification (Alternative 5C) permanently immobilizes the soils and eliminates any future leaching of both organic and inorganic contaminants. All threats associated with soils ingestion and dermal contact, and surface water runoff, would be eliminated. The contaminated oils at the site would be thermally treated in an off-site facility, therefore, eliminating any future toxicity of these wastes.

SELECTED REMEDY

Based upon CERCLA, the detailed evaluation of the alternatives, and public comments, the EPA has determined that Alternative 5C, excavation and on-site solidification is the most cost-effective, environmentally sound remedy for this source control operable unit. This remedy consists of the following components:

1. Excavation of approximately 30,000 cubic yards of contaminated soils followed by on-site solidification of this material. (Figures 5 and 6 indicate the contaminated areas to be excavated.) This volume includes excavation of approximately 8,000 cubic yards of contaminated sediments from the adjacent strip of land west of the site. On-site analytical testing of the soil would be performed, to screen the soils to help determine the required excavation limits. The treated soils would be returned to the same waste management unit from where they were removed, and then graded. Since the solidified soil will remain on-site, the remedy will be reviewed every five years to assure that human health and the environment are being protected.

2. Installation of thirteen deep groundwater drawdown wells along the southern and western perimeter of the site to collect the sinking phenolics contaminant plume (see Figure 5), and installation of shallow dewatering wells to collect contaminated groundwater and oil during excavation. The deep wells would be screened at the top of the underlying till layer.

3. On-site treatment of the collected contaminated groundwater with subsequent discharge of the treated groundwater in accordance with New York SPDES permit requirements. The proposed treatment system would consist of an oil skimmer and oil/water separator that would concentrate the PCB-laden oils floating on the groundwater. Water from the separator would be discharged into a modular water treatment unit. The collected oils would be thermally treated off-site.

4. Off-site thermal treatment of approximately 25,000 gallons of contaminated tank oils in addition to other oils collected at the site, in accordance with the RCRA 40 CFR §264 Subpart O and the TSCA 40 CFR §761.70 requirements. The empty storage tanks would be cleaned and demolished.

5. Treatability studies would be conducted during the remedial design to determine the effectiveness of the solidification process and to determine the optimal treatment system for the contaminated groundwater. Should the treatability study

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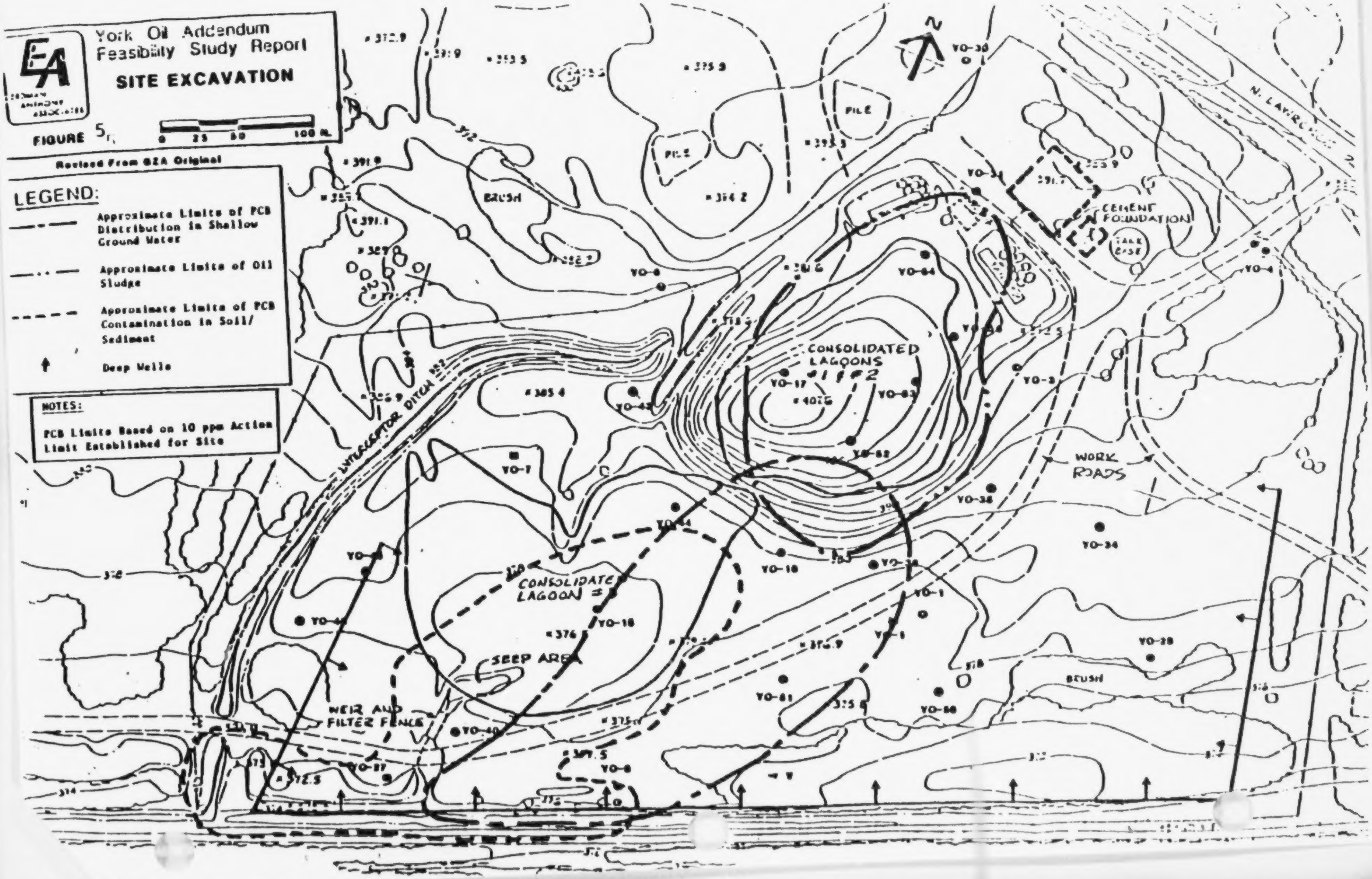
SITE EXCAVATION

FIGURE 5

Revised From GZA Original


EA
0 25 50 100 ft.
N
N. LAWRENCE
PILE
PILE
BRUSH
BRUSH
CEMENT FOUNDATION
CONSOLIDATED LAGOONS #1 & #2
CONSOLIDATED LAGOON #3
SEEP AREA
WORK ROADS
INTERCEPTOR DITCH
WEIR AND FILTER FENCE
YO-30
YO-4
YO-6
YO-64
YO-3
YO-17
YO-63
YO-62
YO-42
YO-7
YO-38
YO-34
YO-18
YO-1
YO-16
YO-28
YO-61
YO-60
YO-40
YO-37
YO-8
• 372.9
• 391.9
• 373.5
• 375.9
• 393.3
• 374.2
• 391.7
• 385.4
• 402.6
• 376
• 376.9
• 372.5
• 375

LEGEND:

Approximate Limits of PCB Distribution in Shallow Ground Water

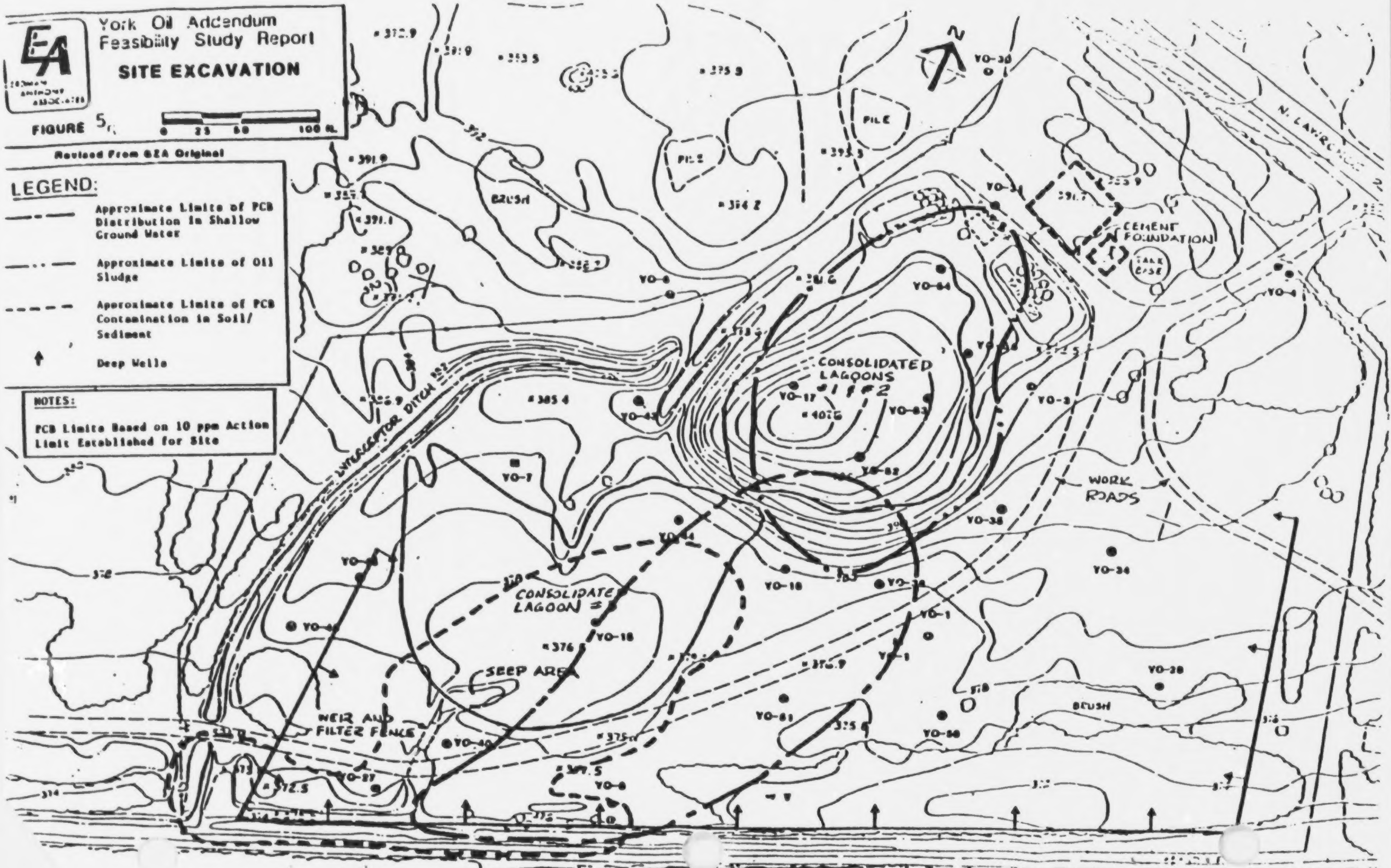
Approximate Limits of Oil Sludge

Approximate Limits of PCB Contamination in Soil/ Sediment

↑ Deep Wells

NOTES:

PCB Limits Based on 10 ppm Action Limit Established for Site



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Feasibility Study Report

SITE EXCAVATION

FIGURE 5

Revised From E&A Original

LEGEND:

- Approximate Limits of PCB Distribution in Shallow Ground Water
- Approximate Limits of Oil Sludge
- Approximate Limits of PCB Contamination in Soil/Sediment
- Deep Wells

NOTES:

PCB Limits Based on 10 ppm Action Limit Established for Site

EA
0
25
50
100 ft.
N
N. LAWRENCE
YO-30
PILE
PILE
BRUSH
CEMENT FOUNDATION
TANK BASE
YO-31
YO-4
YO-84
YO-3
CONSOLIDATED LAGOONS #1 & #2
YO-17
401.6
YO-83
YO-82
WORK ROADS
YO-38
YO-34
YO-10
YO-1
YO-20
BRUSH
YO-81
YO-80
YO-6
YO-43
385.4
YO-7
INTERCEPTOR DITCH
YO-44
CONSOLIDATE LAGOON #3
YO-18
376
SEEP AREA
WEIR AND FILTER FENCE
YO-40
YO-27
YO-8
397.5
372.5
376.9
375.6
372.9
391.9
393.5
375.9
393.3
374.2
391.1
391.7
393.9

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SITE EXCAVATION

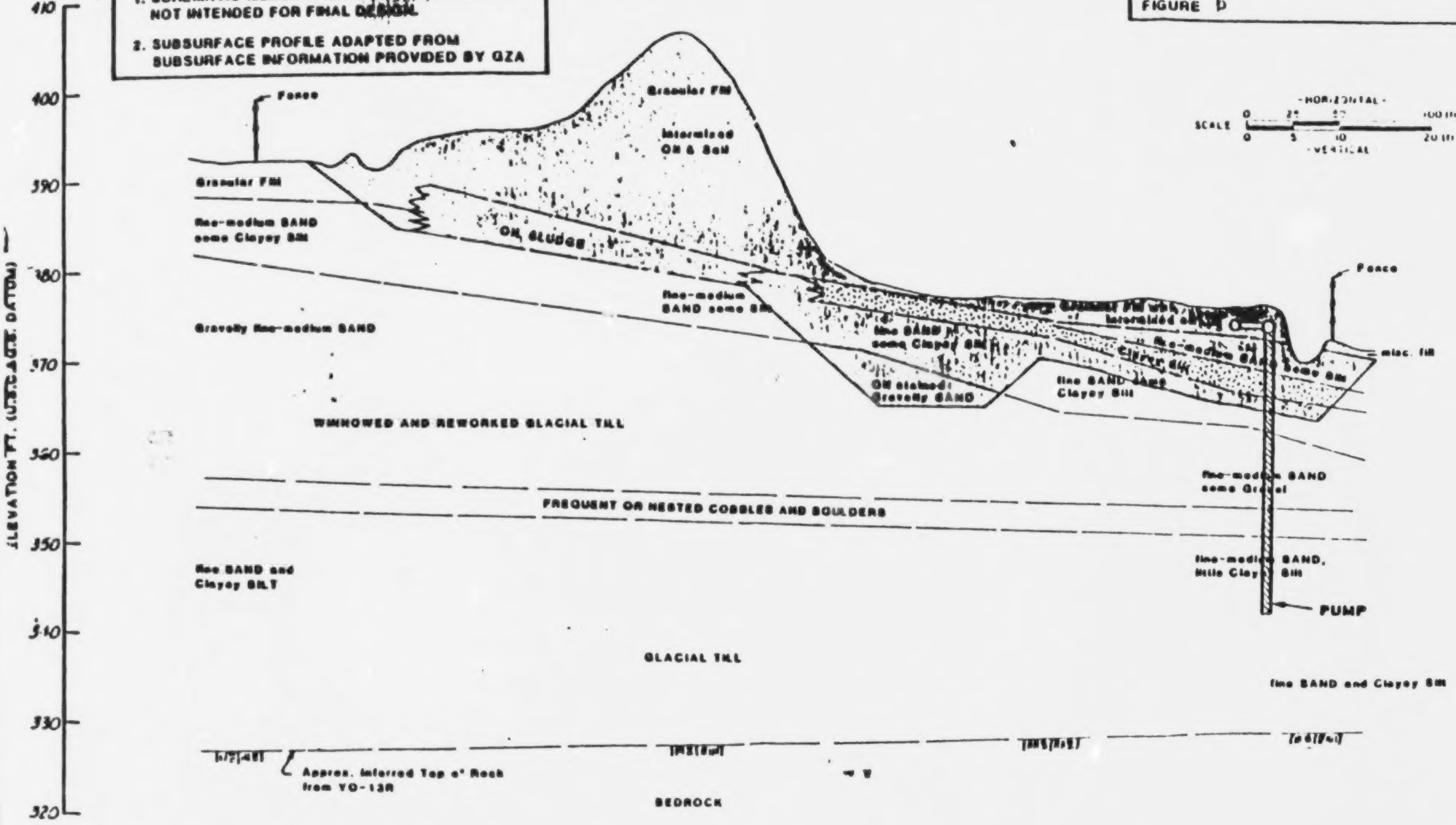
FIGURE 6

LEGEND:

— — — APPROXIMATE TRANSITIONS BETWEEN SOIL TYPES

NOTE:

1. SCHEMATIC ILLUSTRATES CONCEPTUAL DESIGN-NOT INTENDED FOR FINAL DESIGN.
2. SUBSURFACE PROFILE ADAPTED FROM SUBSURFACE INFORMATION PROVIDED BY GZA


ELEVATION FT. (U.S.C.&G.S. DATUM)
410
400
390
380
370
360
350
340
330
320
Fence
Granular Fill
fine-medium SAND some Clayey Silt
Gravelly fine-medium SAND
Granular Fill
Intermixed Oil & Soil
OIL SLUDGE
fine-medium SAND some Silt
fine SAND some Clayey Silt
Oil stained Gravelly SAND
Intermixed oil
fine-medium SAND some Silt
Clayey Silt
fine SAND some Clayey Silt
Fence
misc. fill
WINNOWED AND REWORKED GLACIAL TILL
FREQUENT OR NESTED COBBLES AND BOULDERS
fine-medium SAND some Gravel
fine-medium SAND, little Clayey Silt
PUMP
fine SAND and Clayey SILT
GLACIAL TILL
fine SAND and Clayey Silt
Approx. Inferred Top of Rock from YO-13R
BEDROCK
SCALE
- HORIZONTAL -
0
25
50
100 (ft)
0
5
10
20 (ft)
- VERTICAL -

determine that solidification would not provide the desired degree of treatment, then a treatability study would be performed to determine the effectiveness of thermally treating the soils at the site.

6. An additional operable unit RI/FS for the contamination pathways is in progress to further define the extent of the contamination migration from the site. If remedial actions are determined to be necessary to address the contamination pathways, a subsequent ROD will be prepared.

Cost estimates for the selected remedial action are listed in Table 8.

Table 8 Cost Estimate
Alternative 5C - Site Excavation with Solidification/Fixation

ITEM	PRESENT WORTH
Remedial Action - Short Term Operations	
Common Remedial Action Operations (See Table 6-5)	$ 1,904,935
Excavation & On Site Solidification/Fixation	2,746,800
Dewatering & Deep Wells	99,950
Mobilization (3%)	142,551
Contingency (25%)	1,187,921
Sub-Total Short Term Operations	$ 6,082,157
Remedial Action - Long Term Operations (1 yr, 10% i)	
On Site Treatment System O & M	$ 1,050
Shallow Well System O & M	4,400
Water Treatment Unit O & M	7,450
Sub-Total Long Term Operations	$ 12,900
Remedial Action - Long Term Operations (3 yr, 10% i)	
Deep Well System O & M	$ 14,950
Sub-Total Long Term Operations	$ 14,950
Total Remedial Action	$ 6,110,007
Post Closure Operations (10 yr, 10% i)	
Site Maintenance	$ 102,700
Site Monitoring	397,000
Monitoring Well Maintenance	28,550
Total Post Closure Operations	$ 528,250
TOTAL PRESENT WORTH - ALTERNATIVE 5C	$ 6,638,257

Table 8 (cont'd) Capital Cost Estimate
Common Remedial Action

ITEM	COSTS Alt. 5C
Hydrogeologic Study	$ 120.000
Install. of Monitoring Equip.	
Air	61.900
Groundwater	40.000
Site Work (grading, elec. service, topsoil, seeding, etc.)	201.540
Oil Disposal From Existing On Site Tanks	
Off Site Destruction	115,6[illegible]
Impervious Cap	----
Leachate Pumping System	----
On Site Treatment System (skimmers, O/W separators, & holding tanks)	81.720
Water Treatment Unit	30.000
Personnel Protection	160.375
Wetlands Revegetation (strip of land)	1.043.200
TOTAL	1,904,935

STATUTORY DETERMINATIONS

The selected remedy satisfies the nine evaluation criteria to the greatest extent of any of the alternatives evaluated.

The solidification alternative would comply with federal and state clean-up levels for PCBs, all groundwater ARARs, and surface water discharge requirements (New York SPDES). The contaminated oils would be thermally treated off-site in accordance with RCRA Section 264 Subpart O and TSCA Section 761.70 requirements. In addition, the wastes in the solidified soil would be permanently immobilized in a non-leachable form. The treated soil would undergo the extraction procedure toxicity test and/or the proposed toxicity characteristics leaching procedure test to ensure the permanance of the treatment.

The selected remedy involves placement and treatment of soils and debris wastes. Placement of wastes or treated residuals is prohibited under RCRA Land Disposal Restrictions (LDR) unless certain treatment standards are met. LDR standards have not been promulgated for soil and debris wastes, but when published, the standards may be applicable or relevant and appropriate. Despite the absence of specific treatment standards, the treatment method employed as part of this remedial action satisfies the statutory requirement to substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized.

EPA believes that soils solidification is an availabe and reliable technology for the treatment of wastes types identified at the York Oil site. The treatability study would ensure the site-specific technical feasibility and operational reliability of the solidification process.

The selected remedy satisfies CERCLA Section 121 requirements for utilizing a remedy that permanently immobilizes and reduces the toxicity and mobility of the waste at the site. Solidification of the soils provides the same degree of protection to human health and the environment as the other treatment options, but at a lower cost.

To summarize, EPA's selection of on-site solidification of soils, off-site thermal treatment of oils and deep drawdown wells (Alternative 5C) is protective of human health and the environment, will attain all ARARs, and is cost-effective. Since this option utilizes solidification and thermal treatment to eliminate the principal threat at the site, this alternative would also satisfy CERCLA preference for remedies which employ treatment, as their principal element to reduce toxicity, mobility or volume of the contaminants at the site.

Operation and Maintenance

O&M are those costs required to operate and maintain the remedial action throughout its lifetime. These activities ensure the lifetime effectiveness of the remedial alternative selected.

The selected alternative involves the installation of deep wells to collect the phenolics plume with subsequent treatment of the contaminated groundwater in a water treatment system. It is estimated that thirteen deep drawdown wells would be installed along the southern, eastern, and western perimeter of the site. These wells would be screened at the top of the underlying till layer and are anticipated to consist of six inch diameter stainless steel wells with 25 gallon/minute pumps.

The recommended water treatment system is anticipated to consist of an oil/water separator followed by a modular water treatment unit. The oils would be thermally treated and the contaminated groundwater would be treated and discharged to the wetlands in conformance with New York SPDES permit requirements. A treatability study would determine the optimum water treatment system.

The O&M associated with the first three years of deep well pumping is part of the proposed remedial action, since it is currently projected that it would take three years to restore the quality of the aquifer and cleanup the deep groundwater phenolics plume to a health-based level of 50 ppb for any single phenolic compound and 100 ppb for total phenolics. Therefore, the related O&M costs during those three years would be cost-shared with the State. Subsequent to three years, any additional O&M pumping costs would be incurred utilizing State funds.

As part of the remedial action, a 30-year groundwater sampling program is included to monitor changes in the nature and extent of contamination at the site to determine the effectiveness of the operation.

One hundred percent of the remedial design will be funded by EPA. Cost sharing for construction of the remedy is 90% Federal and 10% State.

SCHEDULE*

Activity	Date
° Public Meeting	December 16, 1987
° Regional Administrator Signs Record of Decision	January 29, 1988
° PRP Negotiations	December 1987 to February 1988
If no PRP pick-up, then:	
° Contractor Procurement Process for Remedial Design	February 1988 to May 1988
° Treatability Study and Remedial Design Begins	June 1988
° Potential PRP Negotiations Completion	December 1988
° Contractor Procurement Process for Construction	December 1988 to March 1989
° Implement Remedy	April 1989
° Construction Complete	October 1990

---

* This is a projected schedule for this site and it is, therefore, subject to future modification.

FUTURE ACTIONS

This ROD addresses the source control operable unit for the York Oil site. An additional operable unit RI/FS for the contamination pathways is in progress to further define the extent of the contamination migration from the site. Further evaluation of the groundwater quality, the extent of contamination in the wetlands and Lawrence Brook, and the potential impact of wildlife and aquatic life such as bioaccumulation in the food chain is being conducted during this study. If additional remedial actions are determined to be necessary, a subsequent ROD will be prepared.

Residential wells currently in use have not been impacted by the site. It is also unlikely that these residential bedrock wells will become contaminated once the remedy has been implemented. The glacial till layer above the bedrock is also a low permeable confining layer. Continued monitoring of the groundwater would be conducted, however, to assure the quality of the groundwater.

The area around the York Oil site has a high sensitivity for the discovery of cultural resources. Accordingly, under the National Historic Preservation Act, a cultural resources survey would be performed during the remedial design phase of the source control operable unit to determine if any historical landmarks or additional cultural resources exist within the undisturbed portions of the York Oil site area.

Because of the similarity of the cultural resource issues associated with the entire area, both the contamination pathways and source control cultural surveys would be conducted concurrently.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-4011

Thomas C. Jorling
Commissioner

JAN 28 1988

TELEX

Mr. Stephen D. Luftig, P.E.
Director
Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

Dear Mr. Luftig:

Re: York Oil Company - Moira, New York

The New York State Department of Environmental Conservation (NYSDEC) has re-examined the remedial action alternatives for the York Oil Company site. The purpose of this letter is to advise you that the NYSDEC will conditionally concur with the U.S. Environmental Protection Agency's (USEPA) recommended Remedial Action Plan which includes site excavation, on-site solidification, groundwater extraction wells, treatment of collected groundwater, thermal treatment of oils stored in tanks, cleaning and demolition of the tanks and surface grading. It appears to us that the on-site solidification alternative is a feasible source control measure for the York Oil site.

As you know, the NYSDEC preferred on-site thermal treatment for the contaminated soils and this is stated in the Record of Decision (ROD). The State, as does USEPA, supports a permanent solution for the York Oil site. Recognizing the potential problems associated with implementation of either solidification or thermal treatment, a treatability study must be performed to answer all uncertainties. We understand that EPA will require treatability studies shall be conducted during the remedial design to determine the effectiveness of the solidification process for the soils and determine the optimal treatment system for the contaminated groundwater. Should the study indicate that solidification of the soils is ineffective, then the effectiveness of thermally treating these soils shall be investigated. Provisions to authorize such an expansion of the treatability study must be stipulated in the ROD.

The selected remedial alternative will require long term monitoring and maintenance. Should the monitoring indicate that contaminants are being released to the environment, then, pursuant to SARA, the selected remedial choice should be re-evaluated by the USEPA for subsequent remedial remedy. Section 121(c) of SARA requires the USEPA to determine the effectiveness of this type of remedial action on a five (5) year interval. This is not discussed in the ROD.

Subject to the above clarifications, we will concur with the remedial alternative selected for the York Oil site. Please send us a revised final version of the ROD at your earliest convenience.

Sincerely,

Michael J. O'Toole, Jr., P.E.
Acting Director
Division of Hazardous Waste
Remediation

cc: G. Pavlou, USEPA, Region II
R. Howe, USEPA, Region II

Reproduced from best available copy

ATTACHMENT C

RESPONSIVENESS SUMMARY

Responses to the public comments on the Draft Addendum Feasibility Study for the York Oil Company Inactive Hazardous Waste Site in Moira, New York.

York Oil Company Public Meeting
Moira, New York - December 16, 1987 -

In attendance were twenty four (24) local residents; three (3) newspaper/radio reporters; three (3) representatives from the New York State Department of Environmental Conservation (NYSDEC) or the "Department"; two (2) representatives of United States Environmental Protection Agency (EPA) or "Agency"; two (2) representatives from Erdman, Anthony Associates (EAA); and one (1) representative from Goldberg, Zoino and Associates (GZA).

Mr. Daniel L. Steenberge, P.E. of the New York State Department of Environmental Conservation chaired the meeting. The meeting began with an introduction of the Government representatives and the Government's consultant with an explanation that the purpose of the meeting was to gather public comment so that it could be used in the decision making process of choosing a remedy for the York Oil Company Inactive Hazardous Waste Site. The introductions were followed by a technical presentation from Mr. Carl W. Eller, P.E. of Erdman, Anthony Associates. Mr. Eller's presentation included a brief history of the York Oil Company Site activities prior to the beginning of work on the Addendum Feasibility Study and detailed discussion of the findings of the Addendum Feasibility Study. An overhead projector was used as a visual aid by Mr. Eller and his presentation was followed by a question, answer and comment period.

A verbatim transcript of the meeting was kept in accordance with the Comprehensive Environmental Response Compensation and Liability Act, 42USC9601, (CERCLA) Section 117, and is attached as Exhibit I. Written comments were received from Reynolds Metals Company and Alcoa Aluminum Company of America and are attached as Exhibit II. Attached as Exhibit III is a general summary of the significant questions, comments and concerns expressed at the public meeting and in written comments along with the Department of Environmental Conservation's responses to the questions, comments and concerns. Attached is Exhibit IV which includes the New York State Department of Health responses to specific comments of Alcoa and Reynolds.

PUBLIC MEETING ATTENDANCE LIST

YORK OIL SITE - TOWN HALL MOIRA
12/16/87

NAME	Address
Ken Mason (Suburban Propane)	Malone, NY
Lee Mulverhill (Suburban Propane)	Malone, NY
Doug Wilson	Massena, NY
Brian Schafer	Massena, NY
Mike Healy	Newark, NY
Wilfred Boyea	Moira, NY
Jane Boyea	Moira, NY
Louie LaRock	Moira, NY
Joseph J. Terry	Moira, NY
Lona Wells	Moira, NY
Mary Wells	Moira, NY
Pete Warner	Moira, NY
Gary Bradford	Moira, NY
Rita Hutchins	Brushton, NY
Wm "Jake" Hughes	Malone, NY
Wayne H. Brockway	Moira, NY
Thomas Finnegan	Moira, NY
Thomas R. Grady	Malone Evening Telegram
Joe Lyon	Moira, NY
Monte Coughlin	WICY
Tammy Wells	Moira, NY

GOVERNMENT REPRESENTATIVES

NAME	Affiliation
Daniel L. Steenberge, P.E.	NYSDEC
Stephen Hammond, P.E.	NYSDEC
Robert Howe	USEPA
Joel Singerman	USEPA
Carl W. Eller, P.E.	Erdman Anthony Associates
Mary Kenny	Erdman Anthony Associates
Raymond Laport	Goldberg Zoino Associates
James Connolly	NYSDEC

TERMS/ABBREVIATIONS

PCB - Polychlorinated Biphenyls - Once widely used industrial chemicals whose high stability contributed to both their commercial usefulness and their long-term deleterious environmental and health effects. Common uses: In electrical capacitors and electrical transformers and as hydraulic fluids, lubricants and cutting oils.

ppm - Parts per million - Abbreviation standing for 1 part in 1 million parts, also written PPM.

mg/l - Milligrams per liter - Abbreviation standing for 1 part in 1 million parts. Applies to aqueous samples.

ug/l - Microgram per liter - Abbreviation standing for 1 part in 1 billion parts. Applies to aqueous samples.

mg/kg - Milligrams per kilogram - Abbreviation standing for 1 part in 1 million parts. Applies to non-aqueous samples such as soil.

ug/kg - Microgram per kilogram - Abbreviation standing for 1 part in 1 billion parts. Applies to non-aqueous samples such as soil.

RI/FS - Remedial Investigation/Feasibility Study - The remedial investigation is the report on the scientific investigation and the feasibility study is the pre-design planning document.

ARAR - Applicabl or Relevant and Appropriate Requirements - Promulgated Federal and State standards that remedial actions must comply with.

EA - Erdman, Anthony and Associates - This is the State of New York's consulting engineer for this project.

GZA - Goldberg Zoino Associates - This is the sub-consultant to Erdman, Anthony Associates.

Portable GC - Portable Gas Chromatograph - This is a scientific instrument used to identify various chemicals.

Phenolics - Class of aromatic organic compounds - The phenolics present at the York Oil Site are most likely due to the use of high-boiling point phenols as fuel-oil sludge inhibitors.

Aroclors - Another name for Polychlorinated Biphenyl - The Aroclors are characterized by four digit numbers, the first two digits indicate that the mixture contains biphenyls (12) and the last two digits give the weight percent of chlorine in the mixture (e.g., Aroclor 1254 contains biphenyls with approximately 54% chlorine).

10^{-4} or 10^{-6} - This is called scientific notation - For example 10^{-4} is .0001 or one ten thousanths and 10^{-6} is .000001 or one one millionath.

CERCLA - Comprehensive Environmental Response Compensation and Liability Act - This is the federal law commonly known as Superfund.

SARA - Superfund Amendments and Reauthorization Act - This is the Federal law which ammended CERCLA.

EXHIBIT I
(see attached transcript)

ALUMINUM COMPANY OF AMERICA
ALCOA BUILDING
PITTSBURGH, PENNSYLVANIA 15219

LEGAL DEPARTMENT

1988 January 19

BY EXPRESS MAIL

RECEIVED
JAN 20 1988
Dept. of Environmental Conservation
REGIONAL ENGINEER - REGION 5
RAY BROOK, NEW YORK 12977

Daniel L. Steenberge, P.E.
Senior Sanitary Engineer
NYS department of Environmental
Conservation
Route 86
Ray Brook, New York 12977

RE: York Oil Site

Dear Mr. Steenberge:

In Alcoa's comments on the above referenced Site (in my letter dated December 17, 1987 and during the December 28, 1987 meeting in Albany) we referred to recent information on the relationship between the degree of chlorination of byphenyls and PCB toxicity. We have been able to obtain a copy of the attached comments of Dr. Stephen M. Roberts, et al., made to the California Scientific Advisory Board dated October 20, 1987. As we stated during the December 28, 1987 meeting we are forwarding a copy of these comments to you for inclusion in the administrative record on this matter.

Sincerely,

Ralph W. Waechter
Attorney
WPPRWW140

Attachment

cc: James Ludlam, NYSDEC
R. Howe, U.S. EPA
Elena T. Kissel, Esq., U.S. EPA

EXHIBIT II

ALUMINUM COMPANY OF AMERICA
ALCOA BUILDING
PITTSBURGH, PENNSYLVANIA 15219

LEGAL DEPARTMENT

1988 January 19

BY EXPRESS MAIL

RECEIVED
JAN 20 1988
Dept. of Environmental Conservation
REGIONAL ENGINEER - REGION 5
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Daniel L. Steenberge, P.E.
Senior Sanitary Engineer
NYS department of Environmental
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Sincerely,

Ralph W. Waechter
Attorney
WPPRWW140

Attachment

cc: James Ludlam, NYSDEC
R. Howe, U.S. EPA
Elena T. Kissel, Esq., U.S. EPA

ORAL PCB COMMENTARY

Before the Scientific Advisory Panel
"Safe Drinking Water and Toxic Enforcement Act of 1986"
State of California

by
Dr. Raymond D. Harbison
Dr. Robert C. James
Dr. Stephen M. Roberts
Division of Interdisciplinary Toxicology
University of Arkansas
School of Medicine
Little Rock, Arkansas

on behalf of
National Electrical Manufacturers Association (NEMA)
Chemical Manufacturers Association (CMA)
Utility Solid Waste Activities Group (USWAG)

October 30, 1987
Sacramento, California

PCB Commentary:
State of California Scientific Advisory Panel -
"Safe Drinking Water and Toxic Enforcement Act of 1986".

Prior to the originally scheduled August meeting of the Scientific Advisory Panel to review polychlorinated biphenyls (or PCBs), we submitted to the panel a detailed review of the published literature relevant to the carcinogenicity of PCBS. This review was submitted on behalf of three national trade associations, who are concerned about their industries, customers, and the general public who may be broadly affected by this panel's actions. The conclusions of our review are:

- PCBs are not mutagenic.
- The only conclusive evidence from chronic animal studies that PCBs are carcinogenic is limited to PCB mixtures containing 60% chlorine.
- Epidemiological studies of highly exposed worker populations have shown no consistent cancer increases attributable to PCB exposures.
- Therefore, the existing data are inadequate to characterize PCBs as probable human carcinogens.

I would like to take this opportunity to briefly review the basis for these conclusions, and I ask this scientific panel to consider the following information before rendering their decision.

All PCB congeners or commercial PCB mixtures are not equal and that it is scientifically incorrect and unjustified to consider all PCB mixtures as equivalent. It is now widely recognized that the chemical properties and toxicities of the 209 discrete PCB congeners are dictated primarily by the degree and position of chlorination; and in general terms, it may be stated that the toxicity increases as the average chlorine content of the PCB mixture increases. Therefore, there are significant and important differences among commercial PCB mixtures, and they should not be evaluated by a single, all inclusive, generic rule that is based on animal data specific to only some PCB mixtures.

PCBs are not genotoxic. A wide range of commercial PCB mixtures and specific PCB congeners have been shown to be without activity in bacterial mutation assays. PCBs have also been found to be inactive in test systems measuring DNA damage, chromosomal damage, and the ability to induce cell transformations. Also, consider the fact that the positive animal carcinogenicity data is specific for highly chlorinated PCB mixtures. Only 3 animal studies have unequivocally demonstrated that PCBs induce liver cancer in rats, and all involved commercial PCB mixtures of 60% chlorine.

Epidemiologic studies have not causally linked PCB exposure to cancer of any type in humans. For the currently available studies to provide evidence for human carcinogenicity would require:

- That these studies show a consistent increase in cancer mortality.
- The increase in cancer to be positively correlated to either the magnitude or the duration of PCB exposure.
- The increase in cancer to show evidence of latency.
- The evidence for carcinogenicity to demonstrate a consistent pattern, that is, specific sites of cancer should be consistently elevated.

A review of the available mortality studies reveals that none of the four criteria for a positive epidemiologic association have been met.

In conclusion, I ask the panel to recognize that PCB mixtures, either manufactured as commercial products or inadvertently generated in processing, are not equivalent. For this reason a generic ruling that treats all PCB mixtures as equivalent human health hazards is scientifically inappropriate and should be replaced by an approach that considers each PCB mixture separately. Consideration of PCB mixtures separately would be consistent with the approach this scientific panel has taken when evaluating other chemical classes and would be consistent with the scientific literature describing the toxicities PCB mixtures of different chlorine content. PCBs are not genotoxic, and PCB mixtures of less than 60% chlorine are not carcinogenic in rats; therefore, clear distinctions should be made between PCB mixtures with a chlorine content of 60% or greater from those mixtures having a chlorine content of less than 60%. Further, none of the PCB mixtures have been found to be carcinogenic by epidemiologic study of capacitor workers exposed to high levels of commercial mixtures. Therefore, I ask this panel to consider each mixture separately or defer any final decision on PCBs until such time that it can consider each mixture on the basis of the data available for the chlorine content of that mixture. Based upon our review of the current scientific literature, we submit that the listing of only commercial PCB mixtures with an average molecular chlorine content of 60% or greater is scientifically justified.

AUG 1 9 1987

LAW OFFICES OF

MORRISON & FOERSTER

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SAN FRANCISCO
WOODLAND HILLS
WALNUT CREEK
PALO ALTO

WASHINGTON D C
DENVER
LONDON
HONG KONG

WRITER'S DIRECT DIAL NUMBER

213-621-9423

Recd by Dr. Book's office
at noon on
8/18/87
-pms

Via Telefacsimile

August 18, 1987

Dr. Steven Book
Executive Secretary
Scientific Advisory Panel
1600 9th Street, Room 450
Sacramento, California

Re: Scientific Advisory Panel
Meeting Slated for August 28, 1987

Dear Dr. Book:

I am writing on behalf of three trade associations: the National Electrical Manufacturers Association ("NEMA"); the Chemical Manufacturers Assocation ("CMA"); and the Utility Solid Waste Activities Group ("USWAG"). NEMA, CMA, and USWAG hereby request that they be permitted to submit a brief joint presentation to the Scientific Advisory Panel, as the panel considers listing polychlorinated biphenyls (commonly known as PCB's) as possible known carcinogens on August 28, 1987.

NEMA, CMA and USWAG will be jointly represented by Dr. Robert James, a toxicologist with the Department of Interdisciplinary Toxicology, University of Arkansas Medical School, Little Rock, Arkansas. Dr. James will be accompanied by Dr. John Craddock, of the Monsanto Chemical Corporation and Steven S. Rosenthal, Esq. of this firm. Dr. James intends to offer a brief (three to five minute) oral presentation, and will be available to respond to any questions from the panel prompted by the oral presentation or a prior written submission being sent to the Panel this week.

For Distribution by CMA
SPECIAL PROGRAMS DIVISION

From E. Festa Gormley
Ref. No. PCB 41/87-087

August 20, 1987

Dr. Steven A. Book
Health and Welfare Agency
1600 9th Street, Room 450
Sacramento, CA 95814

Dear Dr. Book:

The National Electrical Manufacturers Association (NEMA), the Chemical Manufacturers Association (CMA), and the Utility Solid Waste Activities Group (USWAG) jointly commissioned independent toxicology consultants to review the published technical literature on carcinogenicity of PCBs for the upcoming Safe Drinking Water and Toxic Enforcement Act Scientific Advisory Panel (SAP) review on August 28. Enclosed is a copy of the consultants' report for consideration by the SAP in reviewing PCBs. Copies of this document also have been sent under separate cover to each SAP member.

This technical review is based upon animal studies and epidemiological studies of exposed populations with particular emphasis on workplace exposures. The conclusions of the consultants are as follows:

- The data do not indicate PCBs are probable human carcinogens; existing evidence is inadequate to confirm PCBs as carcinogenic.
- Epidemiological studies of highly exposed worker populations have shown no consistant cancer increases attributable to PCB exposures.
- PCBs are non-mutagenic.
- Bioassay results are inconsistent and show no more than limited, inconclusive evidence of animal carcinogenicity except in studies using higher chlorinated PCBs, e.g., 60% chlorine.

We believe that the evidence from animal studies does not justify regarding all PCBs as carcinogenic to humans. At most, the data indicate that only the "higher chlorinated" PCBs, e.g., 60% chlorine and higher, may be classified as suspect animal carcinogens. Reviews of human health effects studies do not reflect any statistically significant human cancer effects resulting from PCB exposure.

ATTACHMENT

Kimbrough, R. D., 1987. Human Health Effects of Polychlorinated Biphenyls (PCBs) and Polybrominated Biphenyls (PBBs). Ann. Rev. Pharmacol. Toxicol. 27:87-111.

New York State Department of Health, June 1987. An Investigation of the Health Status of Workers with Potential PCB Exposure from Hudson River Sediment.

The Massachusetts Department of Public Health. June 1987. The Greater New Bedford PCB Health Effects Study 1984-1987.

BIOLOGICAL DATA RELEVANT TO THE EVALUATION OF CARCINOGENIC RISK TO HUMANS

Prepared for
Scientific Advisory Panel.
Safe Drinking Water and Toxic Enforcement Act
State of California

Prepared by
Dr. Raymond D. Harbison
Dr. Robert C. James
Dr. Stephen M. Roberts

Division of Interdisciplinary Toxicology
University of Arkansas
School of Medicine
Little Rock, Arkansas
U.S.A.

August 1987

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EXECUTIVE SUMMARY

Evaluation of Animal Data

The investigation of PCBs' carcinogenic potential in mice is limited to two short studies, while some eight to ten studies have been reported using various strains of rat. The PCB mixtures tested thus far are : 1) in mice - Kanechlor 300, Kanechlor 400, Kanechlor 500 and Aroclor 1254; and 2) in rats - Kanechlor 300, Kanechlor 400, Kanechlor 500, Clophen A30, Clophen A60, Aroclor 1254 and Aroclor 1260.

PCBs have been found to be tumorigenic in mice with Aroclor 1254 producing hepatomas after 11 months of exposure and Kanechlor 500 (similar in composition to Aroclor 1254) inducing hepatocellular carcinomas after 8 months of exposure. These lesions were shown to be reversible and specific for the dose (500 ppm) and chlorination of the PCB mixture.

In rats, Aroclor 1260 or its equivalent, Clophen A60, have produced hepatocellular carcinomas in three studies at doses of approximately 100 ppm, a dose which appears to represent the maximally tolerated dose for rats. A review of these three studies indicates that the tumors occur very late in the life of the animal, with a significant incidence of tumors only beginning to appear after about two years of exposure. Of interest is the fact that in all three studies the PCB treatment, while increasing the incidence of liver cancer, did not increase the total tumor incidence. The total tumor incidence was not increased in these studies because in each case the incidence of other tumor types had been significantly decreased. This suggestion of antitumor activity of PCBs has also been demonstrated in a study examining the effect of PCB exposure on the final tumor incidence in animals following the transplantation of the Walker 256 sarcoma. The effects of chronic PCB-treatment was not life-shortening, and in fact in two of the studies the morbidity and mortality of the animals was actually decreased by PCB treatment. Furthermore, while the tumors are described as malignant, i.e. hepatocellular carcinomas, in none of the three studies did the liver tumors metastasize to other organs even though metastases would be expected if the tumors were malignant. So from these studies it is evident that PCB-treatment does not increase the total cancer risk in these animals, rather it shifts the incidence of the type of tumors observed by significantly decreasing some tumor types while enhancing the incidence of liver tumors. Lastly, PCB mixtures of lesser chlorination, i.e. Aroclor 1254 and Clophen A30 (similar in composition to Aroclor 1242, see table 1.4, page 8, of Brinkman and DeKok, 1980), have been examined in two separate studies and found not to be carcinogenic. Thus, conclusions to be drawn from the rat data, like the mouse data, are specific for the dose and degree of chlorination of the PCB mixture being tested.

While Bertazzi et al. (1986), in their study of Italian PCB-exposed workers, found a statistically significant elevation in the rate of cancer mortality among both male and female workers, the much larger study of Brown found no increase in cancer mortality. In the Brown study, there were higher-than-expected incidences of rectal and liver cancer. Evidence for an association between PCB exposure and these malignancy types cannot be considered strong, however, in that: 1) no cases of rectal cancer were observed after the initial report, suggesting that this increased rate was anomalous, 2) the number of cases of liver cancer observed in this study is not appreciably greater than expected when examined without total number of liver neoplasms used by Brown which includes those liver cancers that have metastasized from other organs, 3) in comparison, the study by Bertazzi et al. found only one case of liver cancer and no cases of rectal cancer in their cohort, and 4) the absence of a clear association with latency or relationship with duration of exposure.

The primary sites of neoplasms contributing to the higher-than-expected cancer mortality rates in the Bertazzi studies were located in the digestive system and the hematopoietic and lymphatic systems. These were not increased in the larger cohort reported by Brown. Further, in the Bertazzi cohort, there was no evidence of latency or relationship between cancer mortality and exposure to PCBs. It should also be noted that in the larger of the two subdivisions of their cohort, the female workers, differences in incidences of causes of death presumably unrelated to PCB exposure (viz., increases in accidental death and decreases in deaths from cardiovascular disease) were of similar magnitude as increases in death from malignant tumors. This suggests, at least for this group, that other confounding variables may exist.

In summary, epidemiological evidence for human carcinogenicity of PCBs is at present weak and mostly negative. As such, until larger epidemiological studies can be completed, the data must be considered *inadequate to characterize PCBs as human carcinogens*.

BIOLOGICAL DATA RELEVANT TO THE EVALUATION OF CARCINOGENIC RISK TO HUMANS

1.0 Carcinogenicity and Related Studies In Animals

1.1 Studies in Mice

Nagasaki et al. (1972) initially examined the hepatocarcinogenic effects of Japanese brands of PCB fluids by feeding male mice dietary levels of 100 ppm, 250 ppm, and 500 ppm for 32 weeks. As this particular citation represents a short communication, detailed discussions of the experimental design and histopathological examinations of this investigation were lacking. An increased incidence of liver tumors was found in only one of the treatment groups, those mice receiving the 500 ppm diet of Kanechlor 500, where hepatomas were identified in 58% or 7/12 of the animals. The livers from animals in this group also contained nodular areas and many necrotic foci. In sharp contrast to these findings, no hepatomas and none of these histopathologic changes were observed in animals receiving lower doses of Kanechlor 500 or in any of the animals receiving Kanechlor 400 or Kanechlor 300.

The results of the above study also appear to have been reported in two other journals under Ito et al. (1973a&b). As in the previous study it was reported that male mice of the ddY strain were fed diets containing Kanechlor 300, Kanechlor 400 or Kanechlor 500 at dietary levels of 100, 250 or 500 ppm for 32 weeks. PCBs significantly increased the liver weights of the animals, and at the highest dose of Kanechlor 500 the liver:body weight ratio had increased 3-fold with histopathological examination of the livers revealing a focal hypertrophy in the centrilobular hepatocytes of non-neoplastic areas. Another change observed in all PCB treatment groups, except those receiving 500 ppm of either Kanechlor 500 or 400, was a marked amyloid degeneration of the liver in the space between the sinus endothelium and the hepatocytes. For some reason, the liver tumors in these more recent publications (Ito et al, 1973a&b) have been reclassified, and the tumors reported as hepatomas in the previous communication (Nagaski et al., 1972) are now listed as carcinomas (Ito et al., 1973 a&b). That is, in the group receiving 500 ppm of Kanechlor 500 (originally described as having hepatomas in 7/12 animals) nodular hyperplasia was found in 7/12 animals (58.3%) while 5/12 of the livers (41.7%) now have well-differentiated hepatocellular carcinomas. The carcinoma cells were reported to be comprised of irregularly shaped cells with pyknotic nuclei and occasionally had mitotic nuclei. The reason for changing the classification of these neoplasms from hepatoma to carcinoma is not provided. Of some interest to discussions of the carcinogenic potential of PCBs is the fact that all of the other doses of all three Kanechlors tested failed to produce even nodular hyperplasia. Thus, the tumorigenicity reported was quite specific for the dose and the extent of chlorination of the Kanechlor being tested.

Kimbrough and Linder (1974) examined the effects of PCBs in contained fatty degenerative changes, and while 6/10 of the livers from female animals had adenomatous nodules, none of the livers of the male animals contained such nodules. However,the liver nodules observed in the female animals do not appear to be related to the PCB treatment as 2/5 (40%) of the livers from the control female animals also contained adenomatous nodules.

In a second study Kimura et al. (1976) fed 12 female Donryu rats diets containing 400 ppm Kanechlor 400 for 6 months. The estimated dose corresponded to a total of 531 mg of PCBs during this period. Eight of the 12 animals were then sacrificed 590 days after the feeding began. None of these animals developed hepatocellular carcinoma, and 9/12 of the livers were normal in appearance, suggesting that the degenerative changes observed in the previous study are reversible.

Ito et al. (1974) fed male Wistar rats Kanechlor 300, Kanechlor 400 or Kanechlor 500 at dietary levels of 100, 500 or 1,000 ppm for up to 52 weeks. No hepatocellular carcinoma was found in the livers of any of the treated rats. The highest dose of all three Kanechlors did produce a cholangiofibrosis of the liver, but this effect was not observed at the lower doses with any of the Kanechlors. Nodular hyperplasia was observed in 30-40% of the rats exposed to the two highest doses of Kanechlor 500 (i.e. doses of 500 ppm and 1,000 ppm) and in animals receiving a diet containing 1,000 ppm of Kanechlor 400. Oval cell proliferation and proliferation of the bile duct cells were observed in all treatment groups. Hypertrophy of the centrilobular cells was also evident in animals receiving the highest dose of the two most heavily chlorinated PCB mixtures. Fatty changes and fibrosis were also observed in the livers of animals of several of the treatment groups. The fatty changes, hypertrophy and fibrosis of the liver all tended to be present and correlate with the observation of nodular hyperplasia, suggesting that these changes may have been contributory factors.

Kimbrough et al. (1975) published the first major positive study demonstrating that Aroclor 1260 can produce hepatocellular carcinoma in the rat. In this study 200 female Sherman strain rats were fed Aroclor 1260 at a dietary level of 100 ppm for approximately 21 months. There was a statistically significant 6-7% decline in the weight gain of the animals exposed to PCBs in this study suggesting that the dose used approximated the maximally-tolerated dose. The incidence of the histopathological findings from this study are summarized in Table 1. The most consistent histopathologic difference in the PCB treatment group was the finding of hyperplastic or neoplastic nodules in 144/184 (78%) of the livers. More importantly, however, was the finding of hepatocellular carcinoma in 26/184 (14%) of the PCB-treated animals. The tumors were well-differentiated neoplasms of the trabecular type, except in three of the animals which had tumors with a glandular, papillary pattern. Foci of coagulative necrosis were occasionally observed in the cancerous areas, but there was no fibrosis or other evidence of chronic degenerative changes. Tumors one nodular hyperplasia was observed and it was in the group fed 100 ppm of Aroclor 1260 for 12 months. Mortality in this study was high and approximately one-third of the 105 animals anticipated to be exposed for two years at each dietary level died. Hepatomas were observed in 7/25 livers from animals fed 100 ppm Aroclor 1260, in 4/26 fed Aroclor 1254, 3/19 fed Aroclor 1242, and only 1/168 animals receiving the 1-10 ppm diets. Nodular hyperplasia was twice as prevalent as hepatomas in the high dose animals, particularly in the Aroclor 1254 group.

In 1978 the National Cancer Institute examined the carcinogenic potential of Aroclor 1254 (NCI, 1978). Groups of 24 male and 24 female Wistar rats were fed Aroclor 1254 at dietary levels of 25, 50 or 100 ppm for 105 weeks. Clinical signs of toxicity including hair loss, facial edema and cyanosis occurred by week 72 in the high dose animals and the mean body weights were roughly only 2/3-3/4 that of their respective controls. This decrease in body weight exceeds the no more than 10% weight loss guideline for the estimated maximally tolerated dose that is part of the NCI guideline for cancer bioassays (NCI, 1979). Several histopathologic changes occurred in the livers of animals receiving PCBs that appeared to be related to the PCB treatment, particularly the incidence of hyperplastic nodules and adenomas. Male animals had one hepatocellular carcinoma in the 50 ppm group and only 2 in the 100 ppm group. Although the incidence of these tumors was not significant, the occurrence of proliferative lesions did appear to be dose related. In reviewing this bioassay, the Data Evaluation/ Risk Assessment subgroup of the Clearinghouse on Environmental Carcinogens responsible for providing peer review of NCI studies concluded the following :

> "It is concluded that, under the conditions of the bioassay, Aroclor 1254 was not carcinogenic in Fischer 344 rats; however, a high incidence of hepatocellular proliferative lesions in both male and female rats were related to treatment. In addition, the carcinomas of the gastrointestinal tract may be associated with treatment in both males and females. Based on the liver proliferative lesions in the treated rats and published reports, it is suggested that Aroclor 1254 may be a tissue promoter."

Morgan et al. (1981) have taken the same tissue sections that originated in the NCI bioassay (NCI, 1978), stained the stomach sections for alkaline phosphatase, and then re-sectioned these tissues for histological evaluation in conjunction with those provided in the NCI study itself. The final incidence of alkaline phosphatase rich areas was 6.4% in controls, 10.4% in animals fed 25 ppm Aroclor 1254, 16.7% in the 50 ppm group, and 35.4% in the 100 ppm group. These changes were most often noted in the pyloric region of the stomach and duodenum (88% of the lesions were found in these areas), suggesting a toxicity specific to the cells of these areas. Gastric adenocarcinomas comprised six of the 33 total the cellular appearance of the liver tumors of PCB-treated animals.

Schaeffer et al. (1984) used a total of 432 weanling Wistar rats to examine the effects produced by chronically feeding rats Clophen A60 (equivalent to Aroclor 1260) or Clophen A30 (similar in composition to Aroclor 1242; Brinkman and DeKok, 1980). The study consisted of three groups. Group 1, a control group of 139 animals receiving the normal diet, Group 2 with 152 animals receiving a diet containing 100 ppm of Clophen A30, and Group 3 which consisted of 141 animals fed a diet containing 100 ppm of Clophen A60. After day 801 animals were randomly selected and killed, and the experiment was terminated on day 832. The Clophens used in this study were reported to be free of any chlorinated dibenzofuran contamination, but the level of detection for this analysis was not specified. In those animals necropsied prior to day 800, hepatocellular carcinomas were only identified in the PCB treatment groups, one in Group 2 and a total of 9 were observed in Group 3. This latter number was statistically significant for the Clophen A60 treatment, but represented a liver cancer incidence of only 7% for the entire group. In contrast, the incidence of thymoma was significantly reduced by PCB treatment declining from 12% in the control group to 3-4% in the treatment groups. Likewise the total number of the remaining types of neoplasms was significantly reduced by the PCB treatment, with Clophen A60 causing the greatest reduction (from 52 in controls down to 18 in the Clophen A60 group). The final results of this study are shown below in Table 2. The incidence of hepatocellular carcinoma was significantly increased only in those animals receiving the Clophen A60. Thus, the results of this study were consistent with the previous rat studies, i.e. Aroclor 1260, or its equivalent, was reported to have induced hepatocellular carcinoma in rats while a lesser chlorinated PCB mixture was not carcinogenic.

Table 2

Frequency of Hepatocellular Alterations Induced by Chronic Feeding Studies with Clophen A30 and Clophen A60

	# of Foci	Neoplastic Nodules	Hepatocellular carcinoma
Controls (group 1)	6/131 (4.5%)	5/131 (3.8%)	1/131 (0.8%)
Clophen A30 (group 2)	63/130* (48%)	38/130* (29%)	4/130 (3%)
Clophen A60 (group 3)	3/126 (2.4%)	63/126* (50%)	61/126* (48%)

* denotes a significant difference from the control value ($P<0.05$)

and significantly decreased the total tumor load of the exposed rats. In essence, he questions the human relevance of tumors which occur only very late in the life of the animal, are not life-shortening and do not metastasize to other organs of the body. Thus, to quote Young :

> "If the purpose of long-term studies is to extrapolate to humans, then one finds it difficult to infer dire consequences to humans when the treatment is beneficial in the model system. Is the model only useful for inferring bad events? The model should be equally valid for detrimental and beneficial effects."

Lastly, the analysis of Young also calls to question a suggestion made by Schaeffer et al. (1984), which was that the decrease in the incidence of thymoma might be caused by immunosuppressive effects of PCBs. While PCBs cause thymic atrophy at certain doses, any proposed immunosuppressive effect cannot be considered to have a significant clinical impact when the treated animals did not ultimately suffer a greater incidence of morbidity or mortality from either infectious diseases or the cancer induced by this treatment.

The last major rat study reported is that of Norback and Weltman (1985). These investigators fed 70 male and 70 female Sprague-Dawley rats a diet containing 100 ppm Aroclor 1260 for 16 months followed by a reduction to 50 ppm for the next 8 months. The animals were then fed a control diet for the remaining 5 months of their lives. All results were compared to a control group which initially consisted of 126 animals, 63 of either sex. At various time points throughout this study two control animals of each sex and three PCB-treated animals of each sex (10 animals in total) were anesthetized with ether and the medial left lobe of the liver of each animal was surgically removed. These tissue samples were taken at 1, 3, 6, 9, 12, 15, and 18 months. At 24 months a similar group was killed and at the end of 29 months all remaining animals were sacrificed. The induction of liver hypertrophy in the centrilobular area of the lobule was evident at the first observation period made one month after the PCB diet was initiated. By the 18th month the liver:body weight ratio had increased from 4% to 12% in the female animals. Macroscopically these investigators noted evidence characteristic of neoplastic nodules near the capsular surface, hepatocellular carcinomas and adenofibrosis. In the PCB-exposed group, the observed lesions appeared in the following sequence : centrilobular hypertrophy at 1 month, foci of cells appeared at 3 months, foci of altered cells in the centrilobular and midzonal regions at 6-9 months, neoplastic nodules appeared at 12 months, trabecular carcinoma was observed after 15 months and adenocarcinoma at 24 months. Simple cystic cholangioma and adenofibrosis appeared in animals 18-23 months after the exposure began. There was no evidence of metastases to the lungs. All trabecular carcinomas had cell arrangements with a glandular, ductal or cystic pattern and all adenocarcinomas had some elements of the trabecular pattern of growth. The lumens of it would appear that a number of early deaths occurred only in the group of male control animals. These same observations were also noted by the authors, who stated in the discussion of this paper :

> " Although the tumors met the morphological criteria for malignancy, their biologic behavior was relatively unaggressive. The neoplasms did not metastasize to distant organs nor invade blood vessels. Mortality of the animals was not increased. The lack of greater morbidity or mortality is likely due to slow progression of the neoplastic process and late appearance and slow growth of the hepatocellular carcinoma."

The authors further noted that it remains to be established whether PCBs have an initiating effect or whether the neoplasms observed result from the promotion of a background incidence of initiated cells.

1.3 Studies In Other Species

Calandra (1976) reported, in summary form, a carcinogenicity bioassay performed in dogs. Groups containing 4 male and 4 female dogs were fed 1, 10 or 100 ppm of Aroclors 1242, 1254 or 1260 for two years. While this exposure interval is for a period of time that is considerably less than the lifetime of the species being tested, no remarkable findings were reported.

1.4 The Effects of PCBs on Other Liver Carcinogens

PCBs have been tested in numerous studies to determine whether they alter the carcinogenicity of other chemicals. The evidence obtained from such studies is sometimes inconclusive, and in several instances similar studies have produced conflicting results. The results of have been summarized in the following paragraphs and in table 5 located on page 13 :

- A number of studies indicate that PCBs administered after a carcinogenic dose of a liver carcinogen enhance the incidence of tumors. Nishizumi (1976) found that Kanechlor 500 promotes liver tumors initiated by diethylnitrosamine. Kimura et al. (1976) demonstrated that Kanechlor 400 can promote the liver cancer induced by 3'-methyl-4-dimethylaminoazobenzene (MeDAB). Ito et al. (1978) initiated liver tumors with N-2-fluorenylacetamide and then increased tumor incidence by feeding the rats diets containing 1,000 ppm of PCBs. Preston et al. (1981) have reported that Aroclor 1254 with or without polychlorodibenzofuran contaminants can promote the liver cancer initiated by diethylnitrosamine. Osterle and Deml (1984) demonstrated that this effect can be produced in weanling rats, although the immature animal is less sensitive. Deml et al. (1983) have also found that an initial PCB pretreatment to increase

Wistar rats and CD-1 mice from diethylnitrosamine-induced liver tumors (Nishizumi, 1980, Anderson et al., 1983). Likewise Kimura et al. (1976) found that PCBs given before or during MeDAB exposure decreased the incidence of MeDAB-induced liver cancer. Similarly, Makiura et al. (1974) have shown that the co-administration of PCBs with the liver carcinogens MeDAB, N-2-fluorenylacetamide and diethylnitrosamine decreases tumor incidence. Trout fed diets containing PCBs prior to their exposure to aflatoxin had a reduced frequency of liver tumors induced by the aflatoxin (Hendricks et al. 1977). This effect is perhaps explained by Stott and Sinnhuber (1978) who demonstrated that PCBs reduced the bioactivating ability of trout microsomal fractions used to test the mutagenicity of aflatoxin B_1.

- In dermal initiation-promotion assays PCBs have been found to diminish the initiating activity of certain skin carcinogens and to be devoid of any promoting activity (DiGiovanni et al., 1977; Berry et al., 1978). Similarly Hayes et al. (1985) examined the effects of PCBs on the proliferating hepatocytes in livers of young animals or adult animals after partial hepatectomy. They concluded that short-term PCB exposures do not have an initiating action in an *in vivo* assay that detects both hepatic and extra-hepatic initiating carcinogens.

- In contrast to its reportedly adverse effects on the immune system, Kerklivet and Kimeldorf (1977a&b) demonstrated that PCBs administered either in the diet or by injection reduced the size of Walker 256 carcinosarcomas transplanted to rats and increased the lifespan of the PCB-treated animals.

Table 5

Summary of PCB Interactions With Other Carcinogens

Study	**Carcinogen**	**Results**
A. PCBs Administered After the Carcinogen :		
Nishizumi (1976)	diethylnitrosamine	promotion (liver tumors)
Kimura et al., (1976)	Me-DAB	promotion (liver tumors)
Ito et al., (1978)	N-2-fluorenylacetamide	promotion (liver tumors)

However, this effect has also been demonstrated for phenobarbital and is no doubt also true for most other liver enzyme inducing chemicals that produce a hypertrophy or hyperplasia of the liver. Additionally, recent work by Deml and Oesterle (1987) has shown that the promotional effects of PCBs has a threshold, as one might expect, and this threshold appears to be well above the dose commonly encountered by most persons. In contrast to its promotional effects on liver carcinogens known to be initiators, PCBs also act as anticarcinogens when administered prior to the exposure of an initiating carcinogen. This effect is most probably the result of PCB induction of liver metabolism which then acts to decrease the carcinogenic effects of a number of chemicals by increasing their degradation and elimination.

2.0 Epidemiological Studies of PCB Exposure and Cancer Mortality

Published epidemiological studies addressing the carcinogenic potential of PCBs have been confined to two cohorts, both consisting of employees of plants where PCBs were used in the manufacture of capacitors.[Note : Bahn et al. (1976), in a letter to the editor, reported an analysis of eight deaths among 92 research and development workers at a refinery, and suggested an association between PCB exposure and incidence of malignant melanoma. The extremely limited size of their cohort, the inability to adequately assess exposure of the cohort to other, potentially carcinogenic substances or other known risk factors, and the inconsistency of their observations with the results from the two larger cohorts, precludes any utility of this report in the assessment of the human carcinogenicity of PCBs.]

Brown and Jones (1981) have published a retrospective cohort mortality study of employees from two plants. Minimal exposure period to PCBs was three months, and the types of PCBs used were Aroclors 1016, 1242, and 1254. Workers who had potential exposure to trichloroethylene, which was also used in both plants, were excluded from the cohort. Of the 2567 employee cohort, 163 were known to be deceased and the vital status of 55 (2%) was unknown.

Higher-than-expected incidences of cancer in the rectum (primarily among females in Plant #2) and liver were noted, although the differences were not statistically significant. The overall incidence of malignancies observed was slightly less than expected. None of the causes of death showed a clear association with latency, and no relationship was observed between the duration of employment in jobs involving PCB exposure and risk of mortality due to cancer. The causes of mortality and incidences of specific malignant neoplasms are summarized in Table 6.

The study of mortality in this cohort has recently been updated, with the number of deceased increasing from 163 to 295 the study, and exposure was primarily to Aroclor 1254 and Pyralene 1476. While some members of the cohort were also exposed to trichloroethylene, alkylbenzene, and epoxy resins, the number was stated to be few. A total of 27 deaths were observed in the cohort between 1954 and 1978. The overall incidence of cancer observed was significantly higher than expected (14 versus 5.65 expected), contributed primarily by elevated (though not statistically significant) incidences of neoplasms of the digestive organs and lymphatic and hematopoietic systems.

Bertazzi et al. (1986) have recently published an update of their study of PCB-exposed capacitor workers with a modified cohort. Non-production workers at the plant were added to the cohort, and the minimum period of employment was reduced from six months to one week. The size of the cohort was consequently increased to 2100, and the number of deceased to 64. The results from male and female workers were analyzed separately, and are summarized below in Tables 7 and 8.

Table 7

Mortality From Selected Causes of Male Workers Exposed to PCB

		Reference Cohort			
		National Mortality Estimates		Local Mortality Estimates	
Cause of death	Observed	Expected	SMR	Expected	SMR
All causes	30	27.8	108	29.8	101
Malignant tumors	14	5.5	253[a]	7.6	183[b]
Cancer of G.I. tract	6	1.7	346[c]	2.2	274[d]
Lung cancer	3	1.2	250	1.6	187
Hematologic neoplasms	3	0.8	375	1.1	263
Cardiovascular disease	8	7.9	101	9.4	95
Accidents	6	6.8	88	5.8	103
Confidence limits (95%)	[a]= 144-415 [b]= 104-300		[c]= 141-721 [d]= 112-572		

For males, mortality from cancer was significantly greater than expected (14 versus 5.5 expected). Among specific tissues, the observed incidence of neoplasms of the GI tract was significantly higher than expected, and hematologic neoplasms were also greater symptoms reported included acneform lesions and hyperpigmentation. The incidence of hyperpigmentation was high (9/10) among offspring born to mothers pregnant during ingestion of the contaminated rice oil (Higuchi, 1976). This hyperpigmentation gradually faded over the 2-5 months after birth. Developmental tooth and bone defects were noted among some of the offspring (e.g. eruption of teeth at birth, larger-than-usual frontal and occipital fontanelles, and maintenance of a wider sagittal suture than usual). However, postnatal physical and mental development of infants born to contaminated rice oil-exposed mothers paralleled that of healthy infants (Higuchi, 1976).

While it was originally assumed that the rice oil was contaminated with only PCBs (Kanechlor 400), subsequent analysis revealed that there was also extensive contamination with polychlorodibenzofurans (PCDFs) and polychlorinated quaterphenyls (PCQs). Studies in animals have clearly indicated that PCDFs are more toxic than PCBs, and a number of lines of evidence support the contention that the adverse health effects suffered by the rice oil poisoning victims were a result of PCDF rather than PCB exposure. First, the concentrations of PCBs measured in patients with symptoms of Yusho were substantially lower than those observed in a number of studies of healthy, occupationally-exposed workers (Kunita et al, 1984; Masuda et al, 1985). The occupational studies have also shown workers to have undetectable or minimally-detectable concentrations of PCDFs (Kashimoto et al, 1985), while rice oil victims in Japan and Taiwan had significant concentrations of PCDFs, including a number of extremely toxic isomers. These human observations are supported by a study in which monkeys were fed PCBs with levels of PCDF and PCQ contamination similar to that of the Yusho oils (Kunita et al, 1984). Monkeys fed this diet developed dermatologic symptoms resembling those seen in patients with Yusho. Monkeys fed PCBs without PCDF/PCQ contamination, or fed PCQs alone, did not develop dermatologic lesions. Collectively these observations have led to the conclusion that the symptoms experienced by the rice oil poisoning victims were the result of PCDF rather than PCB exposure (Kuratsune, 1980; Kashimoto et al, 1981; Drill et al, 1982; Masuda et al, 1982; Masuda and Yoshimura, 1984; Chen et al, 1984; Kunita et al, 1985; Miyata et al, 1985, and Bandiera et al, 1984).

3.2 Health Effects Information from Environmental Exposure

A number of studies have attempted to measure health effects from environmental exposure to PCBs. The most common source of environmental exposure in these studies was the consumption of Lake Michigan fish (e.g. Humphrey, 1980; Fein et al, 1984; Kreiss et al, 1981; Smith, 1983), although the results from other sources of environmental exposure have also been studied (e.g. Baker et al, 1980). The results from these studies have generally been negative. Interpretation of the meaning of the few positive observations has been hampered by either the absence of a control population matched for known risk factors for the parameter studied, a strong positive correlation between PCB body burden and the body burden of other conditions. Which respect to each of these categories, the following observations and conclusions were noted:

Dermatological effects: Of 11 studies of PCB-exposed workers which reported dermatologic findings, dermal symptoms were noted in all 11. Correlation of dermal symptoms with blood PCB concentrations were generally poor or non-existent. However, collectively the evidence strongly suggests that chloracne may occur when PCB blood levels exceed 150-200 µg/ml.

Liver function: Some abnormality in liver function indicated by a change in one or more relevant clinical chemistry parameters, was observed in five of seven studies of occupational exposure to PCBs. [Though not mentioned by Gaffey, it should be noted that while differences in some parameters indicative of liver function were observed to be statistically significant in some of these studies, these differences were uniformly quite small. Further, with chemical-induced hepatotoxicity one would expect to find a consistent pattern of abnormalities among overlapping indices of liver function. No such consistent pattern was observed.] In no case was the abnormality associated with any measurable adverse health effect. The remaining two studies found no evidence of liver abnormalities. A ninth study found evidence of induction of drug metabolism among PCB-exposed workers (Alvares et al, 1977).

Fat metabolism: There appears to be a correlation between serum triglycerides and PCB exposure in most studies. Results concerning cholesterol are equivocal, with one study showing an increase, one a decrease, and three no change. Conflicting results have also been observed with HDL-cholesterol. Changes in fat metabolism produced by PCBs, if they exist, do not appear to be of clinical significance.

Blood and blood pressure: None of the five studies which examined blood chemistry noted abnormalities associated with PCB exposure. One study of PCB-exposed workers measured blood pressure, but found no association with PCBs.

Symptoms, illness, and other conditions: Five studies report a variety of symptoms among PCB-exposed workers. Most of these symptoms appear to be unrelated to PCB exposure. None of the reports have found significant clinical effects to be associated with PCB exposure.

3.4 Summary of Non-cancer Human Health Effects of PCBs:

PCBs appear to be of low potency in producing adverse human health effects. Among workers with demonstrated high body burdens

TABLE 9

Summary of Microbial Mutagenicity Test Results

Product	Tester Strain	S. typhimurium										E. coli	
		C3076	D3052	G46	TA98	TA100	TA1000	TA1535	TA1536	TA1537	TA1538	WP2	WP2uvr
Aroclor 1268		-	-	-	-	-	-	-	-	-	Neg.	-	-
Aroclor 1254		Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-	Neg.	Neg.	Neg.	Neg.
Kanechlor 500		-	-	-	Neg.	Neg.	-	-	-	-	-	Neg.	-
2,2',5-5-tetrachloro-biphenyl		-	-	-	Neg.	Neg.	-	Neg.	-	Neg.	Neg.	-	-
Kanechlor 300		-	-	-	Neg.	Neg.	-	Neg.	Neg.	Neg.	Neg.	Neg.	-
Aroclor 1221		-	-	-	-	-	-	-	-	-	Neg.*	-	-
4-chloro-biphenyl		-	-	-	-	-	-	-	-	-	Neg.	-	-

Source: Levinskas (1981)
* Based on re-evaluation of Wyndham et al.(1975) by Dr. Safe.

Levinskas, 1981), all of which have been summarized in Table 9, it is concluded that PCBs are not mutagenic in bacterial test systems.

4.2 Clastogenic/Chromosomal Studies

Several test systems designed to measure chromosomal damage have been used to test the potential genotoxicity of PCBs. The only human cell line tested were human lymphocytes in the study of Hoopingarner et al. (1972). The test system used phytohemagglutin stimulated cells which were treated with 100 ppm Aroclor 1254 for the first 24 hours, then again during the last eight hours of the S and G_2 stages of the cell cycle and during the three hours of mitosis. Cytological examinations of the cells during these stages of the cell cycle failed to reveal any effect of PCB treatment on chromosomal integrity.

Green et al. (1975a) tested Aroclors 1242 and 1254 for their mutations in the rat. Aroclor 1254 administered for five days at dosages of 75, 150 or 300 mg/kg or at dietary levels of 25 or 100 ppm for 70 days was likewise without effect. Keplinger et al. (1972) and Calandra et al. (1976) tested Aroclors 1242, 1254 and 1260 in mice at dosages of 500 or 1000 mg/kg and also found them to be without dominant lethal effects.

4.4 DNA Damage Studies

On the basis of sedimentation rates, Stadnicki et al. (1979) have reported that the epoxide of tetrachlorobiphenyl caused single-stranded chromosomal breaks in the DNA of L-929 cells at concentrations ranging from 1 ug/ml to 100 ug/ml. A mixture of two hydroxylated metabolites, and to a much lesser extent tetrachlorobiphenyl, caused some damage at 20 ug/ml and what was reported as significant damage at 100 ug/ml. The significance of this single *in vitro* test is questionable, given the fact that the epoxide metabolite was the only chemical species demonstrating a strong activity in this test system. This conclusion has been reached in part because the authors, on the basis of this study, similarly concluded that the epoxide metabolite is the only chemical species of interest with regards to its potential carcinogenicity. However, all mammalian tests as well those *in vitro* tests containing some activation system were negative, indicating that either the epoxide is not genotoxic in other test systems or quantities of the epoxide sufficient to produce genotoxicity are not generated *in vivo*.

4.5 Cell Transformation Studies

Norback et al. (1981) reported that Aroclor 1254 transformed C3H10T11/2 cells to Type III foci after six weeks of continuous exposure to 10 ug/ml of Aroclor 1254, while a concentration of 1 ug/ml did not. The authors suggested that these results indicate that the effects of PCBs in cell culture may include promotion. In contrast to this study, Pienta (1980) reported Aroclor 1254 did not induce cell transformations after eight days of exposure when utilizing Syrian hamster embryo cells. The highest dose tested was 50 µg/ml, which was five times the highest dose later used by Norback et al. (1981).

4.6 Summary

The results of the preceding studies have been summarized on the next page in Table 10. Given the fact that the only test reported as positive is one of questionable significance, the number of times PCBs have been tested and found to be without significant genotoxicity lead inevitably to the conclusion that these compounds should be considered to be without evidence of genotoxic activity.

incidence of liver cancer, did not increase the total tumor incidence. The total tumor incidence was not increased in these studies because in each case the incidence of other tumor types had been significantly decreased. This suggestion of antitumor activity of PCBs has also been demonstrated in a study examining the effect of PCB exposure on the final tumor incidence in animals following the transplantation of the Walker 256 sarcoma. The effects of chronic PCB-treatment was not life-shortening, and in fact in two of the studies the morbidity and mortality of the animals was actually decreased by PCB treatment. Furthermore, while the tumors are described as malignant, i.e. hepatocellular carcinomas, in none of the three studies did the liver tumors metastasize to other organs even though metastases would be expected if the tumors were malignant. So from these studies it is evident that PCB-treatment does not increase the total cancer risk in these animals, rather it shifts the incidence of the type of tumors observed by significantly decreasing some tumor types while enhancing the incidence of liver tumors. Lastly, PCB mixtures of lesser chlorination, i.e. Aroclor 1254 and Clophen A30 (similar in composition to Aroclor 1242, see table 1.4, page 8, of Brinkman and DeKok, 1980), have been examined in two separate studies and found not to be carcinogenic. Thus, conclusions to be drawn from the rat data, like the mouse data, are specific for the dose and degree of chlorination of the PCB mixture being tested.

Possibly because PCBs produce liver hypertrophy, they enhance the tumorigenesis of certain liver carcinogens if given after the carcinogen in question has had an opportunity to initiate tumors. However, if the PCB exposure precedes or is concomitant with exposure to liver carcinogens the tumorigenic response is typically decreased, probably as a result of an enhanced metabolic detoxification of the carcinogen.

To summarize, the qualitative human relevance of the carcinogenic activity of PCBs based on the animal data is limited. The studies providing some evidence of its carcinogenic activity are specific for the degree of chlorination of the PCB mixture, the total tumor incidence is not increased, and the tumors produced occur only very late in the life of the animal and have no adverse effect on the morbidity or mortality of the animal. There are other considerations that limit concern for the carcinogenic data in rats as well. PCBs are not mutagenic, and the mechanism of tumorigenesis for these compounds therefore would appear to involve an epigenetic mechanism. There is also substantial evidence that the doses used to induce tumors in rats are hepatotoxic, and evidence indicating the neoplasms induced by PCBs are reversible if the exposure is terminated before the animal has been exposed for a considerable portion of the animal's lifespan. All of these findings seriously undermine the human relevance of the animal carcinogenicity data. This is particularly true as the human dosages from past and present human exposures are far lower than those used in the animal studies. Given these considerations, it is concluded that the animal data provides *sufficient evidence* of *limited human relevance* that PCBs of 60% chlorine content (e.g. Aroclor 1260/Clophen A60) for this group, that other confounding variables may exist.

In summary, epidemiological evidence for human carcinogenicity of PCBs is at present weak and mostly negative. As such, until larger epidemiological studies can be completed, the data must be considered inadequate to characterize PCBs as human carcinogens.

5.3 Evaluation

Aroclor 1260/Clophen A60 :

There is sufficient evidence of limited human relevance for the carcinogenicity of Aroclor 1260 in animals.

The human evidence for carcinogenicity of this compound is inadequate .

Aroclor 1254/Kanechlor 500 :

There is inadequate evidence for the carcinogenicity of Aroclor 1254 in animals.

The human evidence for carcinogenicity is negative but inadequate.

Aroclor 1248/Kanechlor 400 :

There is no evidence/insufficient evidence for the carcinogenicity of Aroclor 1248 in animals.

The human evidence for carcinogenicity is negative but inadequate.

Clophen A30/Kanechlor 300/Aroclor 1242 :

There is either no evidence or insufficient evidence for the carcinogenicity of these mixtures in animals.

The human evidence for carcinogenicity is negative but inadequate.

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ALUMINUM COMPANY OF AMERICA
ALCOA BUILDING
PITTSBURGH, PENNSYLVANIA 15219

LEGAL DEPARTMENT

1988 January 15

BY EXPRESS MAIL

RECEIVED
JAN 19 1988
Dept. of Environmental Conservation
REGIONAL ENGINEER - REGION 5
RAY BROOK, NEW YORK 12977

Daniel L. Steenberge, P.E.
Senior Sanitary Engineer
NYS department of Environmental
Conservation
Route 86
Ray Brook, New York 12977

RE: York Oil Site

Dear Mr. Steenberge:

Following a meeting held in Albany on December 28, 1987 among representatives of EPA, DEC, Alcoa and Reynolds the comment period on the proposed remedial action for the above-referenced Site was extended until January 15, 1988. Alcoa has continued its review of the scope of the clean-up alternatives as they are presented in the recent draft Addendum Feasibility Study Report ("1987 AFS"), the 1985 Remedial Investigation Report ("1985 RI"), the 1985 Feasibility Study Report ("1985 FS"), NYSDEC's November 27, 1987 Public Announcement which presented the Department's preferred remedy, and the EPA Proposed Remedial Action Plan.

Alcoa submits the following comments which, together with Alcoa's past comments, including those expressed verbally at the December 28, 1987 meeting, its written comments submitted by letter dated December 17, 1987 and prior written and oral comments made to EPA and NYSDEC, we request be incorporated in the administrative record related to the York Oil Site.

I. Recommended remedial alternatives far exceed, in scope and cost, those necessary to protect human health and the environment and are inconsistent with the National Contingency Plan.

It is abundantly clear from information contained in the 1985 studies that surface contamination at the York Oil

Site occurred as a consequence of a spill of oil, most likely due to tanks being cut open and lagoon dikes being breached. (1985 RI, App. RI-1, page 3; 1985 RI, page 1-9.) Subsequent sampling and analysis demonstrated that the only ground water which exhibits any level of contamination is that confined to the operational area of the site. Indeed, no significant ground water contamination by PCB's exists anywhere at the Site. Further, the contractor which prepared the 1985 studies and the 1987 AFS has noted that the movement of contaminants in the groundwater is slow and that no groundwater drinking wells are threatened by the Site. Although we were not provided with, nor have we had an opportunity to review, records of the NYS Department of Health, we believe that such records would confirm the absence of a threat to drinking water wells.

Any alternative adopted must be the most cost-effective remedy which will protect human health and the environment. The absence of a genuine threat to human health and the environment and the negligible to non-existent migration of contaminants off-site or into the groundwater strongly suggests that the appropriate remedy, not inconsistent with the NCP, is one far less extensive and costly than those preferred by EPA and NYSDEC.

II. Recommended remedial alternatives employing site excavation present the highest exposure risks to workers and the community.

Several of the remedial alternatives involving excavation of site soils, considered in the 1985 FS and the 1987 AFS, present the highest risk of community and worker exposure of any of the alternatives considered:

> "Installation of this system [excavation/off-site disposal] would result in the most severe exposure risks of the alternatives considered. As with the slurry walls and french drain, on-site excavation could result in worker or community contact with the exposed materials. During implementation of this alternative, excavation would be concentrated on the lagoons and the most contaminated materials . . . " (1985 FS, page 6-60)

Similarly, such worker and community exposure would occur under the excavation and on-site incineration options presented in the 1987 AFS. The impact of such exposures were not, but should be, evaluated as part of the risk assessment.

It is highly likely that exposure risks to both workers and the community would be magnified due to on-site incineration. Such "disposal" will also produce emissions that must be of concern. For example, if 50,000 tons of soil containing an average of 2 ppm PCB are incinerated, 250 pounds of PCB will be destroyed. However, because the oil in the lagoons at the site was contaminated with lead (used motor oil), some lead and other metal emissions will result. Lead is particularly easy to volatilize because of its low melting point and the chemical nature of lead compounds used as motor fuel additives. If the lead content of the contaminated soil is 500 ppm, then 50,000 pounds of lead could be volatilized at the high incineration temperatures that will be used. Much of this lead could escape control devices as a fine fume, thus producing an emission situation of concern.

While the increased exposure risks resulting from site excavation may have been presented, albeit buried within a technical discussion, in the 1985 FS, the enhanced risks were not addressed in the 1987 AFS. Therefore, the Moira and surrounding community may not now be sufficiently apprised of these potential emissions, nor will they, in the future, become aware or have any further opportunity to comment upon them since the anticipated incineration units will not require RCRA permits.

III. Information currently available indicates that significant error is contained in the cost estimates for Option 5A, resulting in a substantial understatement of the true costs of this alternative.

The 1985 FS notes that the excavation, transportation and spreading of 2700 cubic yards of wetlands soils will cost $92.87 per cubic yard. (1985 FS, p.B-3) However, the 1987 AFS states that excavation, on-site transportation and incineration can be accomplished at a cost of $145.00 per cubic yard (excavation at $26/cy and on-site transportation and incineration at $119/cy). (1987 AFS, App. I-D, p.2) If the 1985 excavation cost figures are correct then the 1987 estimated excavation costs appear to be far to low.

Further, the 1987 AFS used $215 per ton as the unit cost for incineration of on-site soils (1987 AFS, App. I-D, p.7) and a much lower figure of $119 per ton for incineration of soils in the wetlands area (1987 AFS, App. I-D, p.2). Available data indicates that neither of the estimates employed in the 1987 AFS is realistic.

The attached Waste Treatment Technology Newsletter from BBC, Inc., Publications (Attachment I, hereto) contains a report (pp.7-8) on mobile incinerator equipment which we assume would be similar to the equipment envisioned by the consultant for the Site. This BCC report states that the EPA mobile incinerator operates at a unit cost of $300 to $1000 per ton, depending upon waste characteristics. An ENSCO mobile system is reported to operate at $300 to $400 per ton of contaminated soil. We are aware that IT Corporation and Waste Tech also plan to have mobile equipment in the future and estimate costs to be within these ranges.

The incineration cost estimates employed in evaluating total Option estimated cost are critical since over 38,000 cubic yards (50,000 tons) are included in the clean-up estimate. If the true cost is twice the consultant's estimate (at best a conservative estimate of the magnitude of the error since the soil has no fuel value and high moisture content), the on-site incineration estimate is understated by at least $10 million. If realistic on-site incineration estimates had been employed, Option 5A, the consultant's recommendation, would cost in excess of $35 million.

Such a gross error must be considered in evaluating appropriate, cost-effective remedies.

IV. The absence of Treatability Studies for the Alternative 5 Options renders cost estimates for those Options incomplete and inaccurate.

The contractor has not included any information on the treatability of the soils at the Site or in the wetlands area. Fixation and incineration are complex processes. It is virtually impossible to estimate the true costs or effectiveness of the Alternative 5 Options without treatability work prior to design of a construction program and prior to selection of a remedial alternative. In contrast stands the alternative of closure and capping of the site in situ which will not require additional treatability study prior to design. Such an alternative can immediately progress to design of a construction program. For any remedy requiring further study prior to construction design, the procedures outlined in the recently published EPA *Remedial Action Costing Procedures Manual* (see Attachment II, hereto) be employed to better understand and estimate the costs of the various alternatives.

V. Adoption of NYSDEC recommended PCB clean-up levels does not comply with legally applicable or appropriate and relevant requirements.

In its December 17, 1987 comments Alcoa stated that promulgated EPA PCB clean-up standards, rather than unpublished NYSDEC clean-up "policies" are the applicable standards to which the Site should be remedied. NYSDEC's policy is neither applicable nor appropriate and relevant.

Since the DEC "policy" is not promulgated it may not qualify as a potential applicable standard. *See* "Interim Guidance on Compliance With Other Applicable or Relevant and Appropriate Requirements", 52 Fed. Reg. 32496, 32496-97, August 27, 1987. The EPA promulgated standards are the applicable standards. Neither can the DEC policy be considered in determining the necessary level of clean-up, because there exists an applicable, chemical-specific standard for PCB, Thus, the NYSDEC policy is also neither appropriate nor relevant.

VI. Alternative 5 Options conflict with cleanup standards required under CERCLA amendments.

While recent CERCLA amendments shift clean-up preferences toward treatment, this preference does not exist in a vacuum. Treatment remedies must be those which permanently and *significantly* reduce the volume, toxicity or mobility of site contaminants. SARA §121(b)(1).

Incineration remedies, which at best reduce small and non-threatening levels of PCB while leaving an ash residue containing the true contaminants of concern -- metals, simply do not provide a significant reduction of volume, toxicity, or mobility. Encapsulation or fixation, at a site where the available evidence suggests negligible risk of movement, is of questionable value as a permanent or significant solution.

These conclusions are reinforced by the fact that other suitable remedies are available which will adequately protect human health and the environment. Further, and as described above, the lack of treatability studies at the time of remedy selection means that the significance and permanence of the recommended alternatives is highly speculative, as are the short-term exposures associated with the remedy. Indeed, the alternatives requiring excavation, transportation and incineration, in contrast to other remedies, are those most likely to conflict with the assessment factors required under SARA §121(b)(1)(A)-(G).

Suitably closed and capped, the site presents a very low risk of human exposure and meets the SARA standard by interposing a remedy which will greatly reduce the already low mobility of site contaminants. The applicable clean-up standard should be 25 ppm for PCB under EPA promulgated rules. That standard indicates that no excavation or "treatment" of excavated material is required. Cost-effectiveness, together with maximum practicable protection, remains a requirement of any Superfund clean-up. Treatment, for treatment's sake, has never been a goal or requirement of CERCLA. Where available data indicates that less extensive remedies will provide equal and possibly greater protection, selection of the currently recommended alternatives is inconsistent with the National Contingency Plan and CERCLA.

In sum, the alternatives evaluated and recommended by the consultant, by NYSDEC and by EPA -- the Alternative 5 Options -- are the result of flawed technical analysis and improper application of the standards applicable to Superfund Program clean-ups. Option 5A is simply the most egregious example, since it would incinerate the largest quantity of Site materials (thereby presenting the highest risk of worker and community exposures) and is the most seriously cost undervalued incineration alternative.

In the face of far less expensive, yet equally protective alternatives, selection of any of the Alternative 5 Options contravenes the fundamental requirement that remediation be done in the most cost-effective fashion that will protect human health and the environment. To adopt an extraordinarily costly remedial alternative, with no practical nor demonstrable increase in the protection of human health and the environment, over far less costly and eminently suitable alternatives, is an inherently capricious exercise of agency power. That such an exercise may, in fact, increase community and worker exposures (over those presented by more suitable remedies) confounds reason. It is an exercise which itself poses a threat to human health and the environment.

Sincerely,

Ralph W. Waechter
Attorney
WPPRWW136

Attachments

cc: James Ludlam, NYSDEC
R. Howe, U.S. EPA
Elena T. Kissel, Esq., U.S. EPA

related parts for complete filter arrays. Prices for arrays range from $413 for a single cartridge in-tank filter rated at 300 gallons-per-hour to $4,327 sixty-cartridge systems rated at 6,000 gallons-per-hour. Depth filter media include polypropylene, cotton with a polypropylene core, glass fiber, pleated melamine or granular carbon or resin.

[Indexers: Membranes, Company announcement, Memtek, Raytheon]

RAYTHEON PURCHASES ADVANCED WASTEWATER TREATMENT SYSTEM FROM MEMTEK CORPORATION. Raytheon's new monolithic microwave integrated circuit facility is located in Andover, MA, where it is configured to remove arsenic, fluoride, copper and nickel from wastewater. The Memtek system consists of the company's Teflon™ tubular membrane. Each module contains ten membrane tubes with a pore size of 0.1 μ. According to Memtek's Chris Founier, the system works by first chemically pretreating wastewater to form a suspended solid slurry which is settled and then pumped through the membrane filter. The turnkey system cost approximately $250,000.

[Indexers: Patents, Membranes]

RECENT PATENTS: MEMBRANES

Japan JP 61 200.810 (Cl. B01D13) September 5, 1986
Kurita Water Industries, Ltd.
MEMBRANE FILTRATION OF WASTEWATER
The filtrate from ultrafiltration of wastewater is treated by 2 reverse osmosis units both having 10-60% salt rejection. A biological treatment effluent was ultrafiltered and the filtrate containing 360 COD was subjected to reverse osmosis at 40 times concentration and five times concentration in two units.

Japan JP 61 129.094 (Cl. C02F3/12) June 17, 1986
Nitto Electric Industrial Company, Ltd.
MEMBRANE IN BIOLOGICAL TREATMENT OF WASTEWATER
Wastewater is treated in an aerating tank containing an ultrafilter which is connected to a suction pump or pressurized tank. The aeration prevents contamination and concentration-polarization on the membrane. The aeration prevents contamination and concentration-polarization on the membrane.

East Germany DD 233.823 (Cl. C02F9/00) March 12, 1986
Forschungszentrum Wassertechnik Dresden
BIOLOGICAL AND NATURAL PHYSICOCHEMICAL PRETREATMENT OF CONTAMINATED RAW WATER
A slow flow-through water reservoir is divided into many reaction chambers by flexible membranes, raw water is fed to the first chambers, depending on water quality the water is aerated in the first and optionally subsequent chambers, and the water is allowed to undergo natural self-cleaning in the last chamber, and a water preparation plant is added to the outlet of the reservoir. The mesh size of the first membrane may be larger than subsequent membranes.

[Indexers: Incinerators]

CALIFORNIA DEPARTMENT OF HEALTH SERVICES COMPARES ADVANCED, MOBILE INCINERATOR DESIGNS. The comparison was presented in "Alternative Technology for Recycling and Treatment of Hazardous Wastes." The discussion contrasts four types of thermal destruction systems applicable to site cleanup

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operations. "Each of the processes can readily destroy waste oils and solvent residues. The rotary kiln incinerator, the infrared incinerator and the electric kiln pyrolyzer can detoxify contaminated soils. The rotary kiln and supercritical solubilizer units can detoxify wastewaters.

Rotary kiln units: The EPA has developed a transportable incineration system for on-site thermal destruction of hazardous materials at remote spill or disposal sites. The system can be broken down into three sections: the waste shredder and rotary kiln, the afterburner with venturi gas squelch unit and the scrubber with sound suppressor and fold-down stack. The sections can be transported on semitrailers. Such a system can detoxify up to two tons-per-hour of contaminated dirt (about 15,000 tons-per-year) or up to 60 gallons-per-hour of liquid waste oil. Successful trial burns of heavily chlorinated wastes (like dioxins) were conducted at Times Beach, Missouri in 1985 with destruction removal efficiencies of 99.999% or better. Operating costs for the mobile incinerator range from $300 to $1,000-per-ton depending on waste characteristics. Consequently, these wastes can be disposed of on-site. Design specifications for the EPA mobile incinerator are available nationwide to assist federal and state personnel for Superfund cleanup projects. A few private companies have constructed rotary kiln incinerators. Several have been permitted by the EPA and are operating outside California. For example, Ensco Environmental Services (Little Rock, AR) offers a mobile (seven trailers) unit that can simultaneously incinerate up to four tons-per-day of contaminated solid material together with 150 gallons-per-hour of liquid hazardous wastes. Ensco rotary kiln units have been operating in Florida for on-site cleanups. Operating costs are in the range of $300 to $400 per-ton of contaminated dirt treated.

Infrared incinerators: This comparatively new technology offers tremendous flexibility for the decomposition of solid hazardous wastes. In a typical infrared incinerator, a woven metal conveyor belt carried the wastes under infrared heating elements equally spaced along the length of the insulated furnace. At the end of the furnace, ash residue is discharged to a hopper. Off-gases are sent to a secondary burner where they are destroyed by a propane burner. The flexibility of this technology comes from the operator's ability to vary the residence time (the belt speed), the temperature (the intensity of the heating elements), and the aeration. The infrared furnace's capability to operate with very low air flows is a particular advantage. The process can be operated to minimize emissions of volatile organic compounds and particulates. Infrared incinerators can be constructed as a mobile unit. Shirco Infrared Systems of Dallas, TX, is manufacturing several mobile units expressly for contaminated site cleanup applications. One Shirco unit is employed at a fixed location for hazardous waste treatment. Several other units are used for activated carbon regeneration. Shirco reports that their units can achieve greater than 99.999% DRE of PCBs and dioxin. A mobile unit with a capacity of 100 tons-per-day costs approximately $2.5 million.

Advanced Electrical Reactor: The AER unit uses infrared radiation to pyrolytically destroy incoming wastes. The reactor consists of a tubular core surrounded by an annular radiant zone. A porous sleeve separates the two

United States
Environmental Protection
Agency

Research and Development

Hazardous Waste Engineering
Research Laboratory
Cincinnati OH 45268

EPA/600/S8-87/049 Dec. 1987

EPA

Project Summary

Remedial Action Costing Procedures Manual

RECEIVED

[illegible] R. ATKINS

Brian Burgher, Mike Culpepper, and Werner Zieger

The full manual provides specific procedures for the cost estimating and economic analysis steps required for preparing engineering cost estimates for selecting remedial action alternatives in response to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (40 CFR 300). The manual is designed to be used in conjunction with EPA's manual entitled Guidance on Feasibility Studies Under CERCLA. The audience for this manual includes EPA Regional Project Officers, remedial investigation/feasibility study contractors, and state and local remedial action personnel and other Federal agencies. Detailed procedures are provided for generating estimated capital and annual operating costs, calculating annual costs and present worth for each remedial action alternative, and performing sensitivity analyses of the cost estimates to determine the impact of changes to various cost input parameters. Worksheets are provided to assist the user in developing the feasibility cost analyses. An example cost analysis is provided to illustrate these procedures.

This Project Summary was developed by EPA's Hazardous Waste Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

As the number and scope of remedial actions at uncontrolled hazardous waste disposal sites increase, there is a corresponding need for standard procedures for preparing engineering cost estimates for proposed remedial solutions. The National Contingency Plan (NCP) of 1982 outlines a general approach for conducting remediation at Superfund sites. The purpose of the manual is to provide specific procedures for the cost estimating and economic analysis steps required for the various remedial action planning phases. These phases are:

- Preparing an initial assessment of remedial action alternatives to establish a general cost for the remedial investigation/feasibility process and initial remedial measures.
- Screening remedial action alternatives during feasibility analysis to eliminate those alternatives for which the costs are substantially greater than other alternatives and yet do not provide a commensurate public health or environmental benefit.
- Preparing detailed cost estimates for feasibility studies to aid in selecting a remedial action alternative.

The full manual presents procedures and provides worksheets to accomplish the cost analysis objectives of the phases. The guidance presented has been developed for generalized conditions at uncontrolled hazardous waste disposal sites. The user should modify these procedures where necessary to accommodate site-specific conditions.

ATTACHMENT NO. 2

The anticipated audience for this document includes those persons responsible for Superfund remedial actions: EPA Regional Project Officers, remedial investigation/feasibility study contractors, state and local remedial action personnel, and other Federal agencies. This manual should also be useful to those involved in planning state- and private-lead and voluntary actions, particularly to demonstrate to the public and other interested parties that the selection of a remedial action alternative was conducted according to EPA approved procedures.

Discussion

Chapter 2 of the full manual addresses initial site planning cost estimating. Site response assessment costing is important because it sets the tone for the remedial investigation and feasibility study, and gives a rough estimate of the level of effort and funding necessary to address site problems under Superfund. It is a fairly straightforward procedure requiring minimal time and effort to complete. It should be noted that these initial costs will be superseded by costs derived during the feasibility study process.

The purpose of Chapter 2 is to define the steps of the site response assessment process and offer guidelines as to how costs for each of these steps may be derived. With this data the reader should be able to:

- Construct a site response assessment report outline and identify areas which require estimating.
- Assign order-of-magnitude costs to the applicable sections of the site response assessment report format.
- Determine total order-of-magnitude costs for site RI/FS activities and remedial alternatives available at the site assessment stage.

Chapter 3 describes standard procedures for preparing cost estimates for remedial action alternatives being evaluated during feasibility analysis. Initial site planning cost estimating efforts, discussed in Chapter 2, are based solely on existing data and are performed to provide general cost data associated with RI/FS activities, Remedial Removal measures, and remedial alternatives. Feasiiby study cost estimating is aimed solely at providing remedial altnernr costs using information collected du. the investigation. The sections in Chapter 3 provide an overview of the costing process for both screening and detailed feasibility analysis of alternatives; procedures for economic analysis; guidance on the use of sensitivity analysis; and an example illustrating these cost analysis procedures. Additionally, worksheets are provided to assist the user to estimate, analyze, and present costs for remedial action alternatives.

Brian Burgher and Werner Zieger are with JRB Associates, McLean, VA 22102; Mike Culpepper is with CH$_2$M Hill, Atlanta, GA 30339.
Douglas Ammon is the EPA Project Officer (see below).

The complete report, entitled "Remedial Action Costing Procedures Manual," (Order No. PB 88-113 691/AS; Cost: $14.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

For information Donald Sanning can be contacted at:

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Kissel

REYNOLDS ALUMINUM
Reynolds Metals Company • P.O. Box 27003 • Richmond, Virginia 23261

January 5, 1988

Ms. Elena T. Kissel
Assistant Regional Counsel
Office of Regional Counsel
U. S. Environmental Protection Agency
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26 Federal Plaza
New York, New York 10278

RE: York Oil Superfund Site

Dear Ms. Kissel:

On December 28, 1987 at the invitation of EPA, Reynolds Metals Company attended a meeting in Albany, New York regarding the York Oil Superfund Site. At this meeting, Reynolds learned for the first time that EPA was strongly considering the selection of onsite incineration as the remedial technology at the York Oil site. This fact contradicts the information contained in the letter which Reynolds received from the EPA dated November 25, 1987, which states that:

> "Following a review of the preliminary recommended alternative and other alternatives, the United States Environmental Protection Agency ("EPA") and the New York State Department of Environmental Conservation ("NYSDEC") have selected a preferred remedial action for the York Oil site which at this time includes; site excavation, onsite solidification of soils..."

Reynolds relied on this letter in it's preparation of comments on the November, 1987 Addendum Feasibility Study, and focussed the limited time available in commenting on the solidification option. We frankly do not understand the basis for the Agency's apparent shift in it's position.

Because of this apparent shift, we believe that we have been denied an effective opportunity to comment on all the options addressed in the study. Further, we feel that the EPA has not allowed adequate time for people in the Moira area to publicly review the study. We believe that if the residents of the area knew that onsite incineration was the possible technology of choice, they would have likely commented much more fully on an option that could adversely impact their community.

Ms. Elena T. Kissel
Page Two
January 7, 1988

Additionally, Reynolds believes that the costs and technical feasibility of onsite incineration are grossly underestimated in the Addendum Feasibility Study, and that if onsite incineration is implemented, the final costs will be substantially higher.

In view of the above, Reynolds requests that the EPA allow another 30 days for the submission of additional comments on this Addendum Feasibility Study. We also ask that this letter, and the Agency's response, be made a part of the Administrative Record on this site.

If you have any questions, feel free to contact our Mr. John L. Doyle at (804) 281-3865, or our Mr. Stephen D. Ryan at (804) 281-3952.

Sincerely,

Lawrence C. Tropea, Jr., P.E.
Director, Environmental Control
Corporate Environmental Control
Department

lct/sdr

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LEGAL DEPARTMENT

December 29, 1987

via Federal Express

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Region II
26 Federal Plaza
New York, New York 10278

Re: York Oil Site, Moira, New York
Addendum Feasibility Study

Dear Ms. Kissel:

Aluminum Company of America (Alcoa) submitted a number of comments to you on the Addendum Feasibility Study for the York Oil Site in a letter dated December 17, 1987. These comments also were elaborated upon at a meeting held in the New York DEC Offices in Albany, New York, on December 28, which we attended. One purpose of this letter is to add clarification to several of the issues that were discussed at the December 18 meeting, and to that end we have enclosed for your review documents which support many of the comments Alcoa made in its response to the Addendum Feasibility Study. The other purpose of this letter is to reiterate to you our concern over the fact that we were not advised prior to this meeting that the EPA & DEC were considering thermal destruction of PCB contaminated soils and sludges as an alternative remedial action.

The letter from Elena Kissel, dated November 25, 1987, which accompanied the Addendum Feasibility Study clearly states in the last paragraph on page one, "Following a review of the preliminary recommended alternative and other alternatives, the United States Environmental Protection Agency ("EPA") and the New York State Department of Environmental Conservation ("NYSDEC") have selected a preferred remedial action for the York Oil site...." Based on this statement, Alcoa did not spend time evaluating the various alternatives outlined in the report. We felt that such an exercise would be fruitless since the letter clearly indicated that both the EPA and NYSDEC had agreed on the remedial action plan. Since this is evidently not the case, as was stated during the December 28 meeting, Alcoa requests the opportunity to review and comment on the various options noted in the Addendum Feasibility Study. We believe a 30-day extension of the comment period would be appropriate in this particular instance because the parties were not made aware of the divergence of the opinion between DEC & EPA on the Remedial Action Plan. We are particularly concerned about the cost estimates used in Alternative 5A since they appear to be very crude and not suitable as a basis for decision making. Since no treatability studies have been conducted, it is difficult to understand how management options can be evaluated in enough depth to determine which methods can work, and which method will be most effective. If studies are planned or are underway, we would appreciate receiving information on the results so that we may review it as well.

Alcoa's comments and much of the discussion at the December 28 meeting centered around the "softness" of the data, the lack of extensive data, the disclaimers that the contractor attached to the data and his interpretations of the data, and the misuse of the data for risk assessment purposes. In light of the magnitude of the decisions that will be made concerning site cleanup options, Alcoa feels that the data and analyses are inadequate to provide a basis for such decisions. We feel that a defensible risk assessment should be prepared and that a better definition of the potential for off-site contamination should be established before multi-million dollar decisions are made concerning actions at the site.

If the currently available data is to be used for decision making, Alcoa believes that the data as presented in the RIFS and Addendum Feasibility Study supports the following actions: material in the tanks should be removed and disposed of (by incineration off-site), if PCB levels are above 50 ppm); that the tanks should be cleaned and removed; that the drums containing PCB contaminated solids should be disposed of off-site; that the existence of an underground tank system should be evaluated, and if appropriate, it should be removed; that contaminated "hot spots" (above 25 ppm PCB) in the area south of the site should be excavated and disposed of on the fenced site; and that the fenced site should be graded and capped to control infiltration and surface runoff. Our recommendations are based on the sample data which show no significant groundwater contamination off-site, limited migration of pollutants in groundwater and no migration of PCBs in groundwater, no on-site soil or sludge samples which fail the EP-TOX test, and very low PCB contamination with the exception of some surface oil samples collected in the drainage pathway.

Our reading of the reports leads us to conclude that the sludge lagoons were used primarily for treatment and reclamation of motor oils and that the "bulking" process used by the agencies in 1981-1982 have been effective. The surface contamination appears to be sporadic which supports an inference that the PCB containing substances were spilled at the site sometime after the oil reclamation operations ceased. This should clearly be treated as a spill in accordance with the EPA spill cleanup policy, and we believe that our recommendations are in accordance with that policy.

Thank you for the opportunity to comment on this proposed program. We are interested in seeing that the environment is protected and that the most cost effective approach is taken to insure that the site is properly addressed.

Very truly yours,

Marlene W. Jackson /rv

Marlene W. Jackson
General Attorney

MWJ/rv

Encs.

cc: Robert Howe (w/encs.)
James Ludlam (w/encs.)
Melissa Marshall (w/encs.)

SUPERFUND UPDATE...

NCP AMENDMENTS TO LIMIT USE OF RCRA STANDARDS

The Environmental Protection Agency will not require contaminated ground water at Superfund sites to be restored to the exacting background level in EPA's Resource Conservation and Recovery Act standards, says a draft of proposed amendments to the National Contingency Plan, unless the cleanup involves a waste regulated by Subtitle C or requires an activity like one regulated by RCRA.

Significantly, the NCP draft would not define the capping and containment of hazardous wastes at the Superfund site itself -- long a favored agency cleanup method -- as a disposal subject to regulation under RCRA. Only waste actually removed from a site would potentially be governed by RCRA's strict management standards.

The applicability of other environmental laws would be similarly limited. For example, the NCP would prohibit the use of national emission standards for hazardous air pollutants under the Clean Air Act in the cleanup of inactive asbestos disposal sites unless the site is a former asbestos mill or contains asbestos mill waste. The CAA standard, however, could be relevant and appropriate.

The RCRA regulations became final in May 1980 and took effect in November 1980. Any waste generated before May 1980, therefore, is not a RCRA hazardous waste and not subject to regulation under Subtitle C; disposal sites containing waste generated before May 1980 (meaning most sites on the National Priorities List) are not defined as "RCRA-regulated units," exempting them from Subtitle C also. But toxic wastes deposited in unlicensed landfills and other unregulated dump sites before 1980 may be regulated as hazardous substances under Superfund.

The distinction is critical for polluters, who already face enormous cleanup costs and long-term legal and financial liabilities under Superfund. Agency regulations require contaminated ground water at post-1980 waste units to be cleaned up to expensive, environmentally stringent background levels. They allow EPA to waive the standard by granting an alternate concentration level (ACL) on a site-by-site basis or requiring a maximum contaminant level (MCL) for specific substances set under the Safe Drinking Water Act.

"The source or prior use of many wastes at [Superfund] sites cannot be positively identified. Yet the [Superfund] waste may be identical to a listed RCRA waste. If [Superfund] waste would not otherwise exhibit the characteristics that would make it a RCRA hazardous waste ... the RCRA regulations for hazardous waste would not be applicable to manage-

(Continued)

EPA TO LIMIT USE OF RCRA STANDARDS (Continued)

ment of the [Superfund] waste. Certain RCRA regulations, especially the land-disposal restrictions and design and operating requirements, would very likely be relevant and appropriate to management of [Superfund] waste," it says.

RCRA ground-water standards are potentially relevant and appropriate only when "two basic jurisdictional prerequisites" are satisfied: 1.) The substance being cleaned up must be a RCRA hazardous waste; 2.) it must be removed from a RCRA-regulated waste unit or destined for final treatment, storage or disposal in a RCRA-regulated unit.

"If the jurisdictional prerequisites are not fulfilled, then none of the [RCRA] treatment, storage and disposal regulations will be [legally] applicable. Note that these requirements may still be relevant and appropriate," the NCP draft continues.

"Because many [Superfund] actions address RCRA waste that is not in a RCRA-regulated unit, a key question in evaluating whether the basic jurisdictional prerequisites are fulfilled is the determination of which [Superfund cleanups] involve movement of RCRA hazardous waste in such a manner as to constitute treatment, storage or disposal. EPA has determined that any physical movement, alteration or disturbance of RCRA hazardous waste due to remedial action may constitute a new act that fulfills the RCRA definition of treatment, storage or disposal." (Emphasis added)

NCP To Define Treatment, Storage and Disposal

Treatment will involve any physical, chemical or biological change that neutralizes the waste, recovers energy or other resource from it or renders it nonhazardous, according to the NCP amendment.

Storage covers any Superfund cleanup activity resulting in "the holding of hazardous waste for a temporary period, at the end of which the waste is treated, stored or disposed of elsewhere," it says. Disposal occurs only when RCRA hazardous waste is removed from a non-RCRA unit at a Superfund site and disposed of in a RCRA-regulated unit. Disposal occurs when waste is removed from the Superfund "unit," treated and returned to its original location.

The shifting of hazardous waste within a non-RCRA unit is not disposal. "Similarly, the covering and sealing off of hazardous waste at a non-regulated [Superfund] unit, called 'capping with waste in place,' is also not considered disposal, and RCRA disposal requirements would not be applicable."

RCRA Land-Disposal Restrictions May Apply

If a cleanup involves the excavation and treatment of hazardous waste banned by RCRA from land disposal, the disposal prohibitions would apply, says the draft NCP. "If, however, banned waste is merely moved, graded or treated entirely within the original [non-RCRA] unit, then ... placement has not occurred, and the land-disposal restrictions are not applicable," it says. "Nevertheless, depending upon the site, [EPA or the state] may find that, while the land-disposal restrictions are not applicable, they may still be relevant and appropriate."

Another restriction on the use of RCRA standards (the background level, MCL or ACL) would limit them to sites containing RCRA hazardous wastes that were deposited after July 1982 — the date federal ground-water monitoring rules took effect — and that are leaking into ground water beneath the site. But the corrective-action requirements in the 1984 RCRA amendments for releases into off-site ground water would apply regardless of when the waste was deposited at the site.

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+ pcb

Compensation, and Liability Act (superfund law) for costs at the Conservation Chemical Co. hazardous waste site in Missouri (*Armco Inc. v. Maryland Casualty Co.*, US SupCt, No. 87-744).

A federal district court held in favor of the insurance company, determining that the insurer had no duty to defend or indemnify because the government's suit was for injunctive relief, and not for damages that would normally be covered under the policy (*Maryland Casualty Co. v. Armco Inc.*, DC Md; 24 ERC 1980).

The U.S. Court of Appeals for the Fourth Circuit rejected the lower court's distinction between legal and equitable forms of action, holding instead that the insurance policy's own definition of damages excluded coverage of response costs (*Maryland Casualty Co. v. Armco Inc.*, CA 4; 26 ERC 1281).

In its petition, Armco Inc., the waste generator, argued that the court rulings were contrary to the purposes of the superfund law, creating an artificial distinction between actions under the law for damages to natural resources, which would be covered under a policy, and actions for response costs, which would not.

Armco said the approach used by the courts frustrated the congressional policy behind the superfund law's enactment and ignored decisions by other courts that held that response costs were damages for the purpose of comprehensive general liability policies. Armco also argued that the approach taken by the lower courts would create obstacles to the efforts of parties to take remedial actions at hazardous waste sites.

Drinking Water

SCIENTIFIC BASIS FOR REGULATIONS DISCUSSED BY SCIENCE ADVISORY BOARD

The diversity of the more than 200 types of polychlorinated biphenyl compounds can lead to regulatory headaches and scientific wrangles, such as those Environmental Protection Agency regulators experienced at a Science Advisory Board meeting Nov. 19.

The EPA science advisers met to suggest how the agency can regulate PCBs found in drinking water. According to Krishan Khanna, a pharmacologist in the criteria and standards division of EPA's Office of Drinking Water, the agency could evaluate the toxicity of individual PCB congeners, select the most toxic congeners, or consider a PCB mixture as a single compound.

SAB member Larry Kaminsky, chief of the New York Department of Health's Biochemical and Genetic Toxicology Laboratory, said there is no clear decision on which PCB congener is the most toxic. He suggested the agency base its risk assessment and regulatory decisions on the toxicity of the types of PCBs actually found in drinking water, not the class of chemicals in general.

Deciding which, if any, adverse health effects PCBs cause in humans is another challenge, because PCBs often are contaminated with polychlorinated dibenzofurans, EPA officials said.

According to Stephen Hamilton, manager of environmental science and technology at General Electric Corp., recent research on PCB-containing sediments in waterways shows that heavily chlorinated compounds are being converted into PCBs with less chlorine.

Dechlorination is important because PCBs containing fewer chlorine atoms are more soluble, more volatile, and break down more easily than heavily chlorinated biphenyls, Hamilton said.

Scientists speculate that anaerobic bacteria in sediment with no free oxygen remove some of the chlorine from the PCBs, he said.

Hamilton told BNA Nov. 23 that GE researchers found heavily chlorinated PCBs in the first inch or so of sediment from a number of waterways. They expected to find the same contaminants lower down, but instead found PCBs containing fewer chlorine atoms, he said.

Most of the lesser-chlorinated PCBs found in the sediment are *ortho*-substituted, he said, meaning that the dechlorinating process tends to work on *meta*- and *para*- substituted compounds. *Meta* and *para*-substituted PCBs are the types of biphenyls that tend to bioaccumulate and are retained in humans, he explained.

Researchers at Michigan State University are conducting further study to determine the ecological conditions required for the establishment of enough bacteria to dechlorinate PCBs at an observable rate, Hamilton said.

Hazardous Waste

INTERIM PROCEDURES FOR SEEKING ASSESSMENTS OF HEALTH EFFECTS OF TOXIC RELEASES ISSUED

Interim procedures for individuals to follow when requesting a health assessment of releases of hazardous substances were issued Nov. 24 by the Agency for Toxic Substances and Disease Registry.

The health effects assessment process is required under the Superfund Amendments and Reauthorization Act of 1986 and the Resource Conservation and Recovery Act. Comments are being requested on the interim procedures to help the agency prepare final regulations for the initiation and conduct of health assessments and other health effects studies (52 FR 45018).

ATSDR said the purpose of a health assessment is to evaluate information on the release of hazardous substances by assessing current or future impacts on public health; developing health advisories or other public health recommendations; and identifying studies or actions needed to evaluate, mitigate, or prevent human health effects.

The request should contain:

- The name, address, and telephone number of the person requesting the assessment;
- The organization that the person represents, if any;
- The name and location of the facility or release of concern;
- A statement of what is the perceived potential health problem associated with the release;
- A statement requesting HHS to perform a health assessment; and
- Any other information, such as the nature and amount of the release, substances of concern, media contaminated, potential pathway for human exposure, and agencies which have been notified or have investigated the facility or release.

The requests should be sent to Associate Administrator, Agency for Toxic Substances and Disease Registry, Chamblee, Building 27, 1600 Clifton Road N.E., Atlanta, Ga. 30333.

Written comments on the interim procedures should be submitted by Feb. 22, 1988, to Director, Office of External Affairs, Agency for Toxic Substances and Disease Registry, Chamblee 28 South, at the address above; specify docket number ATSDR-3.

For more information, contact Georgi Jones, director, Office of External Affairs, Agency for Toxic Substances and Disease Registry, Chamblee 28 South, at the above address; telephone (404) 454-4620.

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COMMENTS OF THE CHEMICAL MANUFACTURERS ASSOCIATION ON EPA'S PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATION FOR PCBS

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COMMENTS OF THE CHEMICAL MANUFACTURERS ASSOCIATION ON EPA'S PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATION FOR PCBS

INTRODUCTION

The Chemical Manufacturers Association (CMA) PCB Program Panel welcomes this opportunity to comment on EPA's proposed National Primary Drinking Water Regulations. 50 Fed. Reg. 46936 (Nov. 13, 1985). CMA's PCB Panel has been an active participant in numerous EPA rulemakings, particularly pursuant to the Toxic Substances Control Act (TSCA), concerning PCBs. Throughout its history, the Panel has worked closely with EPA to assure that any PCB regulations are both protective of public health and consistent with reasonable assessment of potential risks.

As detailed in these comments, we urge that EPA revise its proposal establishing a Recommended Maximum Contaminant Level (RMCL) of zero for PCBs in drinking water. EPA errs in its conclusion that PCBs are a Category I probable human carcinogen. To the contrary, there is only limited, inconclusive evidence of animal carcinogenicity. Accordingly, an RMCL of zero is unjustified. We propose that the Agency instead, rely on significant work of the Food and Drug Administration (FDA) to assess potential risks of PCB in the diet and, following its lead, adopt an RMCL of at least 6.5 micrograms (~~μm~~ μg) per liter.

I. THE ONLY EVIDENCE THAT PCBS ARE CARCINOGENIC IS FROM ANIMAL STUDIES THAT ARE LIMITED AND INCONCLUSIVE.

Extensive data exists on PCBs. Highly exposed worker populations have been studied, and the compound has been administered in a wide variety of toxicology studies. Based upon this extensive data base, it is possible to reach reasonable conclusions about any potential risk that might be posed from the presence of PCBs in drinking water. Although it is not possible to conclude that absolutely no adverse health effects would be expected, more than enough data exists to indicate that EPA would err by concluding that it should establish a PCB RMCL of zero.

A. Epidemiologic Studies of Highly Exposed Worker Populations Have Found No Significant Cancer Increases.

Several epidemiology studies of highly exposed worker populations have found no significant cancer increases. 1/ Studies by Brown and Jones and by Bertazzi, *et al.*, of 2,567

1/ Earlier reliance on studies in Yusho is no longer considered appropriate. Yusho Oil is not representative of PCB heat transfer fluids, as it contained, in addition to PCBs, high levels of polychlorinated dibenzofurans and polychlorinated quarterphenyls. In consideration of these facts, several scientists have concluded that PCBs were not the cause of poisoning in Japan or Taiwan. *See* Kuratsune, "Yusho," in *Halogenated Biphenyls, Triphenyls, Napthalenes, Dibenzodioxins and Related Products* (1980); Chen, *et al.*.

(Footnote Continued)

and 1,310 workers, respectively, exposed for up to more than 20 years, have not demonstrated any consistent relationship between exposure to PCBs and the development of any particular cancer. 2/ In addition, the more recent epidemiological review by Lawton, *et al*., 3/ of medical records of General Electric workers with PCB exposure in electrical capacitor manufacture found only minor dermatological effects, unremarkable physical examinations, and no signs of chloracne past or present. The study demonstrates that extensive exposure to PCBs in the occupational setting, sufficient to have established blood levels in excess of 200 ppb, has not led to any clinical disease states.

(Footnote Continued)

"Polychlorinated Biphenyls, Dibenzofurans, and Quarterphenyls in the Toxic Rice-Bran Oil and PCBs in the Blood of Patients with PCB Poisoning in Japan," 5 *Amer. J. Ind. Med*. 133 (1984); Kashimoto, *et al*., "Role of Polychloriantted Dibenzofuran in Yusho (PCB Poisoning)," 36 *Arch. Environ. Health* 321 (1981); Masuda and Yoshimura, "Polychloriantted Biphenyls and Dibenzofurans in Patients with Yusho and Their Toxicological Significance," 5 *Amer. J. Ind. Med*. 31 (1984); and Kunita, *et al*., "Causal Agents of Yusho," 5 *Amer. J. Ind. Med*. 45 (1984).

2/ Brown, D. P., and M. Jones, "Mortality and Industrial Hygiene Study of Workers Exposed to Polychlorinated Biphenyls," 36 *Arch. Environ. Health* 120-29 (1981); Bertazzi, P. A., *et al*., "Mortality Study of Male and Female Workers exposed to PCBs," Paper presented at the International Symposium on Prevention of Occupational Cancer (April 21-24, 1981, Helsinki, Finland).

3/ Lawton, R. W., *et al*., "Studies of Employees Occupationally Exposed to PCBs," *General Electric Progress Report* (1981).

The reference in EPA's Health Advisory draft on PCBs (at page 4) to an increase in incidence of malignant melanoma in petrochemical workers exposed to PCBs and other identified chemicals should be afforded no weight. This study 4/ is not adequate to reach conclusions of an association with carcinogenicity due to the small number of individuals exposed and the confounding variable of exposure in the workplace to many other chemicals. Indeed, the study was subsequently withdrawn for revision and has not been reissued. 5/

In sum, substantial human data indicate even heavily exposed workers have not developed serious clinical diseases attributable to PCBs. No significant human evidence of PCB association with any cancer exists.

B. Contrary to EPA's Discussion, All PCBs Have Been Found to Be Non-Mutagenic.

There is also no significant evidence that PCBs are mutagenic in test systems or in human populations. It is thus quite unlikely that PCBs would exert mutagenic activity

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4/ Bahn, A. K., *et al.*, "PCBs and Melanoma," 296 *New England J. Med*. 108 (1977); Bahn, A. K., *et al.*, "Melanoma After Exposure to PCBs," 295 *New England J. Med*. 450 (1976).

5/ *See* NIOSH 1977 Criteria for a Recommended Standard: Occupational Exposure to Polychlorinated Biphenyls (PCBs), USDHEW, NIOSH Publication No. 77-225.

in humans. This conclusion is consistent with the lack of excess cancer incidence observed in PCB-exposed human populations.

EPA's reference to a mutagenicity assay of 4-chlorobiphenyl as being positive, 50 Fed. Reg. at 47002, is inaccurate. That study is contradicted by numerous other mutagenicity assays of PCDs. 6/ More significantly, the co-author of that study has, since its initial release,

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6/ McMahon, et al., "Assay 855 Test Chemicals in Ten Tester Strains Using a New Modification of the Ames Test for Bacterial Mutagens," 39 Cancer Res. 682 (1979); Environmental Protection Agency, "Ambient Water Quality Criteria for Polychlorinated Biphenyls," EPA 440/5-80-068 PB 81-117798 (1980); Bruce and Heddle, "The Mutagenic Activity of 61 Agents as Determined by the Micronucleus, Salmonella and Sperm Abnormality Assays," 21 Can. J. Genet. Cytol. 319 (1979); Schoeny, et al., "Non-mutagenicity for Salmonella of the Chlorinated Hydrocarbons Aroclor 1254, 1,2,4-trichlorobenzene, mirex and kepone," 68 Mutat. Res. 125 (1979); and, Rinkus and Legator, "Chemical Characterization of 465 Known or Suspected Carcinogens and Their correlation with Mutagenic Activity in the Salmonella Typhimurium System," 39 Cancer Res. 3289 (1979).

Other studies that support the lack of mutagenic activity for PCBs include an absence of effects in the micronucleus test and sperm morphology tests. (Bruce and Heddle (1979) previously cited; Jensen and Ramel, "The Micronucleus Test as Part of a Short-Term Mutagenicity Test Program for the Prediction of Carcinogenicity Evaluated by 143 Agents Tested," 75 Mutat. Res. 191 (1980).

Others have shown that PCBs did not produce chromosomal damage in the testes and bone marrow of rats (Dikshith, et al., "Effect of Polychlorinated Biphenyl (Aroclor 1254) on Rat Testes," 22 Exp. Mol. Path. 376 (1975); and, Garthoff, et al., "Biochemical and Cytogenetic Effects in Rats Caused by Short-Term Ingestion of Aroclor 1254 or Firemaster BP6," 3 Toxicol. Environ. Health 769 (1977).

indicated that he had been unable to replicate the result and that it was his belief that PCBs should not be considered mutagenic. 7/

In sum, no prediction of PCB carcinogenicity can be based on any mutagenicity results.

C. The Inconsistent Bioassay Results Show No More Than Limited, Inconclusive Evidence of Animal Carcinogenicity.

EPA's placement of PCBs in Category I based upon strength of evidence of carcinogenicity is inappropriate. The existing data do not provide "sufficient human or animal evidence of carcinogenicity" to warrant the regulation of PCBs "as probably human carcinogens." 50 Fed. Reg. at 46948. To the contrary, the only possible evidence indicating carcinogenic risk is in the animal data and that data should place PCBs in Category III as it is "inadequate" evidence of carcinogenicity. Id. At a minimum, PCBs should be placed in Category II given that the evidence is "limited inconclusive evidence ... from animal data." Id.

A sizeable volume of animal experimental work has been directed toward chronic studies of PCBs in several species: the mouse, the rat, and the dog. The data shows: (a) the

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7/ See Affidavit of Dr. Steven Safe submitted to EPA in 1980 by the Dow Chemical Company. A copy of that affidavit is attached as Appendix A to these comments.

evidence on carcinogenicity is negative for gastrointestinal carcinoma and bladder carcinoma in rats and hepatocellular carcinoma in the dog; and (b) some studies have reported an increase in hepatocellular carcinoma in mice and rats exposed to commercial PCBs, whereas other studies have afforded negative results. 8/

Animal studies thus do not provide convincing evidence that PCBs induce liver cancer. Of the major studies in the rat, one has been judged positive and two have been negative. Hepatic carcinoma was not produced in the dog. Chronic administration of Aroclors in the rat did not induce bladder cancer, gastrointestinal carcinomas, or cancer of

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8/ See, Ito, N., et al., "Histopathologic Studies on Liver Tumorigenesis Induced in Mice by Technical Polychlorinated Biphenyls and Its Promoting Effect on Liver Tumors Induced by Benzene Hexachloride," 51 J. Natl. Cancer Inst. 1637 (1973); Kimbrough, R. D. and R. E. Linder, "Induction of Adenofibrosis and Hepatomas of the Liver in BALB/cJ Mice by Polychlorinated Biphenyls (Aroclor 1254)," 53(2) J. Natl. Cancer Inst. 547-52 (1974); Kimbrough, R. D., et al., "Induction of Liver Tumors in Sherman Strain Female Rats by Polychlorinated Biphenyl (Aroclor 1260)," 55 J. Natl. Cancer Inst. 1453-59 (1975); Calandra, J. C., "Summary of Toxicological Studies on Commercial PCBs," Proc. of the National Conference on Polychlorinated Biphenyls Chicago, Ill. (Nov. 19-21, 1975); Calandra, J. C., "Summary of Toxicological Studies on Commercial PCBs," Proc. of the National Conference on Polychlorinated Biphenyls 35-42 (EPA-560/6-75-004) (1976); National Cancer Institute, Bioassay of Aroclor 1254 for Possible Carcinogenicity, No. 38, NEW (1978); Preston, B. D., et al., "Promoting Effects of Polychlorinated Biphenyls (Aroclor 1254) and Polychlorinated Dibenzofuran-free Aroclor 1254 on Diethyl-Nitrosamine-Induced Tumorigenesis in the Rat," 66(3) J. Natl. Cancer Inst. 509-25 (1981).

the thyroid gland, pituitary gland, adrenal gland, uterus, lung, hematopoietic system, or other organs.

Much of the controversy surrounding this issue involves interpretation of the significance of hepatocellular proliferative lesions noted in some but not all chronic studies. The liver is a target organ for PCBs. Chronic administration of sufficiently high levels of PCBs can induce liver injury in animals leading to a proliferative response in hepatic tissue. This response may be reparative in nature and not due to genotoxic interactions, since the majority of short-term assays demonstrate that PCBs are not mutagenic. Based on these considerations, exposure to moderate environmental levels of PCBs would not pose a significant carcinogenic risk to man.

In sum, EPA errs by concluding that PCBs are a probable human carcinogen. There is "inadequate" evidence of carcinogenicity to reach such a conclusion. At best, PCBs should be placed in SDWA Category II given the "limited inconclusive evidence . . . from animal data." Accordingly, consistent with RMCLs proposed for other substances at this time, a numerical number other than zero should be established as the RMCL for PCBs.

II. ~~UNJUSTIFIED EXPENDITURE OF SOCIETAL RESOURCES WOULD BE MANDATED BY ESTABLISHMENT OF A ZERO RMCL FOR PCBs.~~

Revise Section Heading

Delete this paragraph

~~Should EPA adopt an RMCL of zero for PCBs, it will be required to fashion a Maximum Contaminant Level (MCL) for PCBs that will, in turn, require either monitoring and/or treatment of all drinking water in this country for this substance. As PCBs can be expected to be found in most drinking water supplies only at very low levels, it would be inappropriate to initiate this regulatory action based on an RMCL of zero that will require inevitably much monitoring throughout the country. Much more appropriate, given the limited inconclusive evidence of carcinogenicity, would be determination at this time of a reasonable limit for a PCB RMCL.~~

CMA thus urges that the RMCL for PCBs not be zero. To the extent the Agency feels a need to establish any RMCL, an appropriate basis for such a value would be in FDA's conclusion that the tolerance for PCBs in the diet should be 13 micrograms per day. The Food and Drug Administration has set a tolerance limit of 2 ppm PCBs in fish (21 C.F.R. Part 109). Assuming an average person's daily consumption of ~~PCBs in~~ fish containing 2 ppm PCBs is 6.5 ~~gm~~ g/day, the average daily consumption of PCBs would be 13 µg/day. Accordingly, given average human consumption of 2 liters of water per day, the RMCL would be 6.5 µg/liter.

CONCLUSION.

CMA urges that an RMCL for PCBs be established at at least 6.5 µg/liter. Such an RMCL would be more than adequately protective of the nation's drinking water supplies and would more accurately reflect the substantial epidemiologic and toxicologic information on this substance.

Environmental Monitoring, Statistics, and the Law: Room for Improvement

TEVEN P. MILLARD*

oncerns over environmental degradation have led to leg-
lation such as the Clean Water Act, the Clean Air Act,
e Resource Conservation and Recovery Act, and the Com-
rehensive Environmental Response, Compensation, and
iability Act. Federal and state laws have mandated the
reation of numerous monitoring programs to ensure or de-
ermine the integrity of the environment. Unfortunately,
any of the resulting monitoring programs shed little light
n the questions that they were meant to help answer because
ey are based on poor experimental designs and a super-
icial knowledge of statistics. This article briefly discusses
ome past environmental-monitoring designs and current
egulations for monitoring at hazardous-waste sites. The
eficiencies of many monitoring programs are linked to the
eed to improve the status of the career category "statis-
ician" in the sphere of the environmental sciences.

EY WORDS: Environmental Protection Agency; roundwater monitoring; Power; Sampling design; Statis-
ician; Type I error; Type II error.

1. INTRODUCTION

e past two decades have witnessed a flurry of legis-
in the realm of environmental protection, such as the Clean Water Act, the Clean Air Act, the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Anderson (1983) gave a more comprehensive list of federal environmental legislation, and Loftis et al. (1986) discussed legislation pertinent to groundwater monitoring. Federal, state, and local statutes have mandated extensive environmental monitoring, ostensibly in the interest of environmental protection. Consequently, there has been an increase in the demand for professionals to design monitoring programs, analyze the resulting data, and implement environmental policy decisions based on these results. But who designs these monitoring programs? Who analyzes these data? And how much statistical reasoning goes into environmental policy decisions? Based on my limited experience, it appears that many environmental monitoring programs lack grounding in fundamental statistical principles, precluding any meaningful data analyses meant to address the nominal network objectives. Qualified statisticians simply are not consulted in the design, analysis, or policy-making phase of environmental-monitoring programs, or else they are ignored. My goal in this article is to alert the statistical community to the sometimes shoddy state of statistics in environmental-monitoring, in the hope of encouraging more participation and research in this area.

2. STATISTICAL NATURE OF ENVIRONMENTAL MONITORING

Environmental monitoring may have many objectives, including estimation of baseline physical or biological parameters (e.g., what is the background concentration of mercury in a particular stream?), detection of standards violations (e.g., does the concentration of mercury in the effluent from a certain paper mill constitute a violation of the effluent permit?), and/or determination of the presence or absence of a change or impact in an area (e.g., has Love Canal contaminated the soil in adjacent neighborhoods?). Environmental-monitoring data reflect multiple sources of variability, including natural fluctuations in space and time, as well as deviations resulting from field measurement, storage and handling, and laboratory analysis techniques. If it is important to be able to detect a change on the same order of magnitude as the variability inherent in the variable, then careful consideration of statistical issues is essential.

The usual procedure for analyzing environmental monitoring data is to set α (the probability of making a Type I error) to some fixed value (conventionally .01, .05, or .10), apply some standard statistical test, and then appropriately reject or not reject the null hypothesis. Often, little or no attention is given to the power of the test, and rarely are the underlying assumptions of the test questioned. An "ideal" procedure for designing an environmental-monitoring program might be somehow to quantify the cost of making a Type I error and a Type II error and then to balance the levels of α and β (the probability of a Type II error) to reflect these costs, perhaps through a decision-theory approach (Berger 1985). It should be stressed, however, that the basic question of how to balance both kinds of errors is not a statistical one but a political one. Examples in the next section show how this issue is improperly handled or completely ignored in many environmental-monitoring programs.

3. EXAMPLES OF STATISTICAL SHORTCOMINGS IN ENVIRONMENTAL-MONITORING PROGRAMS

In this section, three examples are given that illustrate some of the statistical problems that prevail in environmental-monitoring programs and regulations.

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Difference and Minimal Detectable Difference

In 1979, the Analytic Sciences Corporation developed what they termed optimal environmental-monitoring programs for the New England Power Service Company (Duffy and Luders 1979). The aim of these programs was to detect any change over time in the abundance of certain organisms in Mount Hope Bay in southern Massachusetts. The effectiveness of a monitoring program was defined in terms of "average differences in the [between times] . . . catches which are detectable with a given confidence level" (Duffy and Luders 1979, pp. 2–5). Suppose $\overline{X}_1$ and $\overline{X}_2$ denote the mean catch in years 1 and 2, respectively, based on n_1 and n_2 observations. Let $\overline{Y} = \overline{X}_2 - \overline{X}_1$ denote the difference in means between these two years, and let $s_{\overline{Y}}$ denote the estimated standard deviation of $\overline{Y}$. Duffy and Luders (1979, p. A-2) stated that the smallest detectable population change, Δ, can be estimated as

$$\Delta = t_\alpha s_{\overline{Y}}, \tag{3.1}$$

where t_α denotes the critical value of the t statistic for a two-sided level-α test with $(n_1 + n_2) - 2$ df. Apparently, Duffy and Luders believe that if $\alpha = .05$, $n_1 = n_2 = 12$, and $s_{\overline{Y}} = 1$, then a change of $\Delta = 2.074$ could be detected with 95% confidence. Actually, the correct value is $\Delta = (2.074 + 1.717) = 3.791$, assuming that observations between sampling occasions are independent. Equation (3.1) is of course incorrect because account has not been taken of the power of the t test; it is the formula for the least significant difference (Sokal and Rohlf 1981, p. 244), not the minimal detectable difference (Sokal and Rohlf 1981, p. 262). In fact, Δ in (3.1) is identical to the minimal detectable difference for a power of .5. Ironically, Duffy and Luders (1979, p. A-2) stated that "account was not taken of the Type II error. . . ."

Duffy and Luders (1979) based part of their research on the work of Saila, Pikanowski, and Vaughan (1976), who confused minimal detectable difference with least significant difference in exactly the same way. The "optimal" monitoring designs of Duffy and Luders were approved by Region I of the U.S. Environmental Protection Agency (EPA) (Duffy, Luders, and Ketschke 1981). Millard and Lettenmaier (1986) demonstrated an approach to optimizing sampling designs based on the more appropriate minimal detectable difference.

3.2 Example 2: Environmental Monitoring at Love Canal

In the early 1980s, in response to a state-of-emergency order by then President Jimmy Carter, the EPA conducted a study to determine whether a specific residential area surrounding Love Canal, termed the Emergency Declaration Area, was contaminated (EPA 1982). Chemical concentrations in the soil and other media were compared among the Emergency Declaration Area, the Love Canal Area, and a control area. Problems with the poor experimental design of this study and the subsequent chemical analyses were discussed by Anderson (1983), Bross (1985), Office of (1986, 1987). A [illegible]ponse to thes[illegible] [illegible]isms was given by Seilkop and Akland (1987).

The basic flaws of the study included a lack of sufficient control sites and samples, a lack of adequate number of replicates, poor quality control, and pseudoreplication (i.e., treating correlated observations as independent; see Hurlbert 1984). For example, becasue of the small number of control observations, in most cases there was no significant d[illegible]ence between the Love Canal area and the control area (OTA 1983). Despite the shortcomings of this study, it was the major input to the habitability decision reached by the U.S. Department of Health and Human Services (DHHS), which concluded in 1982 that the Emergency Declaration Area "is as habitable as the control areas with which it was compared" (DHHS 1982; also cited by OTA 1983, p. 6).

3.3 Example 3: Current Legislation Requiring Groundwater Monitoring at Hazardous-Waste Sites

Sections 264 and 265 of Title 40 of the Code of Federal Regulations (Office of the Federal Register 1986a), established under the authority of RCRA, mandate groundwater monitoring in the vicinity of hazardous-waste sites. Section 265 outlines a nominal groundwater-monitoring program for an interim period (before the site gains an approved permit) and requires the submission of a more comprehensive monitoring program for subsequent operation. Section 264 outlines regulations for monitoring during the active life of the facility.

Section 264 addresses three kinds of monitoring [illegible]grams: detection monitoring, compliance monitoring [illegible] corrective-action monitoring. Section 265 deals only with detection monitoring. Only detection monitoring under Section 264 will be discussed in this example. The aim of detection monitoring is to determine whether the concentrations of certain chemicals have increased above their normal background levels in the groundwater near the hazardous-waste site. The regulations provide that background level is to be defined by one year of quarterly sampling of the control well(s) (hydraulically upgradient from the waste site). Sampling at the compliance-point wells (hydraulically downgradient from the waste site) must occur at least semiannually during the life of the facility. (Detection monitoring under Sec. 265 requires at least one upgradient well and three downgradient wells.)

Each time that a single well sample is taken at a compliance-point well, at least four subsamples must be taken (i.e., four laboratory replicates are measured). These subsamples are referred to as "portions" in Section 264, and as "aliquots" in the groundwater-monitoring literature (see Groeneveld and Duval 1985; McBean and Rovers 1985). When sampling is performed at the control well(s), Section 264 requires at least one sample per well and at least four samples from all of the control wells. Hence, if only one control well exists, four "replicates" from this well must be taken each quarter during the sampling year us[illegible] determine the background levels. It is not clear whether these four "replicates" for a single control well should be well (field) replicates or laboratory replicates (aliquots). The mandate of aliquots for compliance-point wells, however, apparently leads most or all hazardous-waste operators to use aliquots (McBean and Rovers 1985).

On each sampling occasion, for each compliance-point well and each chemical of interest, the hazardous-waste operator must compare the average of the four aliquots at the compliance-point well with the average background level. If the background level coefficient of variation (cv) is less than or equal to 1 (a check against gross nonnormality), the comparison is made using Cochran's approximation to the Behrens–Fisher Student-t test at the .05 level. If the cv is greater than 1 or if the regional EPA administrator so directs, an "equivalent" statistical procedure is used. It is not clear what observations and what averages are used. Should the operator treat the 4 aliquots from the compliance-point well as 4 independent observations from one population and the 16 observations from the single control well (4 aliquots for 4 quarters) as independent observations from another population? This is what the EPA has directed (Loftis et al. 1986, p. 87). The more appropriate analysis uses the averages over aliquots as the observations, in which case there are four observations for the control well and one for the compliance-point well. It is also not clear how data from different quarters for the same compliance-point well are combined. Apparently, past data at a compliance-point well are ignored.

If the results of the t test yield a significant difference between a compliance-point well and the control well(s), the hazardous-waste operator is instructed to obtain a new compliance-point well sample and four aliquots from this new sample and to repeat the t test based on these new aliquots. If the result is again significant, only then does the operator conclude that a statistically significant change has occurred and subsequently notify the regional EPA administrator of the finding.

There are obviously several deficiencies in these requirements for groundwater monitoring. First is the idea of preferring aliquots (lab replicates) to well replicates (field replicates). McBean and Rovers (1985) recognized that both intersample and intrasample variability should be taken into account when comparing compliance-point and control wells. They present analyses of certain groundwater constituents and show that the concentration of these constituents in a well sample increases with the number of bailings at the well. They also incorrectly conclude that intersample (between bailings) variability is significantly greater ($p < .05$) than intrasample (between aliquots) variability by using a conventional F test. What they actually show is that intersample variability is significantly greater than 0, because that is what the F test is testing. Results given in their paper, however, can be used to compute unbiased estimates of both components of variability. Table 1 shows that, as is to be expected, intersample variability can be orders of magnitude larger than intrasample variability. The requirement of treating aliquots as independent observations is in essence mandated pseudoreplication (Hurlbert 1984). Groeneveld and Duval (1985) suggested that it is more cost-effective to sample more frequently and with fewer aliquots, because for a given set of wells, the main cost of monitoring is from analyzing samples, not collecting them.

Table 1. Estimates of Variance Components Based on Data in McBean and Rovers (1985)

Parameter	SS	df	MS	EMS	$\hat{\sigma}^2$
Conductivity					
Between	9,207	3	3,069	$\sigma_w^2 + 3\sigma_b^2$	1,002
Within	500	8	63	σ_w^2	63
Chloride (mg/l)					
Between	55	3	18	$\sigma_w^2 + 3\sigma_b^2$	5
Within	24	8	3	σ_w^2	3

A second problem with these regulations is the balance between the power and Type I error associated with the required monitoring design. The authors of the regulations were apparently aware of the problem: If a test other than the t test is used, it must be one that "reasonably balances the probability of falsely identifying a non-contaminating regulated unit [hazardous-waste site] and the probability of failing to identify a contaminating regulated unit" in a manner comparable to the t-test procedure (Office of the Federal Register 1986a, p. 448). For the t-test procedure, however, the Type I error and power are not easily calculated because of the requirement of resampling in the case of a significant result. Clearly, the effect of resampling is to decrease the Type I error below the assumed .01 or .05 level and decrease the power as well (Groeneveld and Duval 1985). On the other hand, the effect of pseudoreplication is usually to increase the probability of a Type I error (Millard, Yearsley, and Lettenmaier 1985). In any case, the power must be extremely small if past data at the compliance-point wells are ignored. Groeneveld and Duval (1985) suggested that in light of the cost of groundwater cleanup and known risks to human health, it is probably best to set β (1 − power) to a value much smaller than α; but of course β will depend on Δ, the true increase in chemical concentration above background level.

Before Type I error and power can be balanced in some manner, they must be defined. But how should they be defined in the light of multiple individual tests for various water-quality parameters, multiple tests over time, and one set of control data for multiple compliance point/control comparisons? Multivariate methods and multiple comparison procedures could surely help in the design and analysis of monitoring programs.

Finally, the emphasis on using parametric tests for data that are typically highly skewed and often contain "nondetect" values is questionable. Nonparametric tests for censored data (e.g., Prentice and Marek 1979) might be more appropriate in many cases.

4. HYPOTHESES ABOUT THE POOR STATE OF STATISTICS IN ENVIRONMENTAL MONITORING

Many of the problems noted in the previous section are the result of the lack of involvement of qualified statisticians in monitoring design, data-analysis, and policy decisions. Much of the work performed under the RCRA, the CERCLA, and other environmental laws is done by engineering and geotechnical consulting firms, who usually employ professionals in areas of expertise other than statistics. As a result, many reports generated by these firms attempt to apply textbook statistics, sometimes incorrectly, and almost always without consideration of the power of the monitoring design network. Many introductory courses and textbooks in statistics do not emphasize the concepts of power and experimental design for lack of time and space (Hurlbert 1984). For instance, the first edition of Zar (1974) contains only a brief mention of the concept of power, whereas the second edition (Zar 1984) devotes numerous pages to the topic.

What is the explanation for the widespread misuse of statistics in environmental monitoring? The problem clearly is not a lack of research in development of statistical methods for environmental data (e.g., Caselton and Zidek 1984; Eynon and Switzer 1983; Gilbert 1987; Hawkins and Cressie 1984; Hirsch and Slack 1984; van Belle and Hughes 1984). It is not clear that the problem can be explained by a lack of technology-transfer mechanisms either: The American Statistical Association (ASA) has sponsored eight symposia on statistics, law, and the environment (see *The American Statistician*, November 1985, Part 2).

Part of the answer may be explained by a difference in attitude toward statistics between the environmental-monitoring field and other professions that have much closer ties with statistics. The medical and pharmaceutical professions, for instance, have long recognized the advantages and importance of employing statisticians (Meier 1978). For example, the May 1986 issue of *Amstat News* contains 10 advertisements for openings for biostatisticians in the nonacademic sector but only one opening in the area of environmental monitoring. Salsburg (1985) even argued that in some cases the medical profession overemphasizes the importance of classical inferential statistics.

On the other hand, "statistician" does not appear to be a well-defined career category in the sphere of environmental monitoring. For example, the Federal Code of Regulations requires that any alternative groundwater-monitoring design for the interim period of a hazardous-waste facility (other than the one prescribed in Section 265) be approved by a qualified geologist or geotechnical engineer; even though this is a sampling-design problem, the services of a statistician are not required as well. Furthermore, it is up to a regional EPA administrator to dictate what statistical tests are to be used for the monitoring programs at each hazardous-waste site, yet only 1 region out of 10 (Region V) employs anyone with the position title of *statistician* or *mathematical statistician* (EPA Headquarters Personnel Office, personal communication, August 20, 1986). (In all fairness, the EPA does employ 28 mathematical statisticians and 51 statisticians who are based at the EPA headquarters in Washington, D.C., and the three laboratories in Las Vegas, Cincinnati, and Durham.)

Hiring more statisticians at the EPA regional offices may not solve the problem of respectability, however. U.S. Office of Personnel Management requirements define a mathematical statistician as someone who performs "professional work involving the development and adaptation of mathematical statistical theory and methodology," yet the basic requirement is a B.A. or B.S. degree (not necessarily in statistics) with 12 semester hours of mathematics and 6 of statistics (U.S. Office of Personnel Management 1981). There are no additional degree or course requirements specified for increasing GS levels.

Why is the practice of statistics stronger in drug and medical research than in the area of environmental m[illegible]toring? One possible explanation is that the former area[illegible] research are much older than the latter. The Food and Drug Administration was established in 1931, although its beginnings date back to the Food and Drug Act of 1906. The area of drug research has had time to build a strong link with statistics. In comparison, the EPA is a young agency, established in 1970, and environmental monitoring is a young science. It will take time for a statistical tradition to develop in this field.

Minton (1983) noted the general lack of visibility of statistics as a discipline. He points out that much of the problem is due to "nonstatisticians" thinking of a statistician as someone who merely performs computations, not someone who can also help with the intellectual part of research (such as the design). The widespread availability of statistical packages for personal computers and the growing trend toward expert systems may well lead to much less involvement of qualified statisticians in any phase of environmental-monitoring studies.

5. HOPE FOR THE FUTURE

There are a few dim rays of hope for an improved role for statisticians and statistics in environmental monitoring:

1. In September 1983, the EPA announced a new st[illegible] on the determination of the habitability of the Emergency Declaration Area surrounding Love Canal (Perlez 1983), ostensibly because it found significant migration of chemicals during the summer of 1983, but almost certainly because of statistical criticisms leveled against the past study as well.
2. Recently, the ASA was asked to review EPA-funded acid precipitation research. The results of this review were summarized by the ASA Coordinating Committee (1985).
3. In August 1986, the EPA announced that it was considering revising the regulations for groundwater monitoring at hazardous-waste sites and requested "comments from the public to assist in the regulatory development process" (Office of the Federal Register 1986b, p. 29812). The public includes statisticians hired by industry to analyze these regulations.
4. The ASA has to date organized three research conferences supported by the ASA and the EPA on environmental monitoring and statistics.

What can statisticians do as a community to nurture the growing awareness of the importance of statistics in environmental monitoring and in general? In the academic sector, instructors of statistics courses should emphasize to their students that a few statistics courses will not train ther[illegible] be statisticians but will enable them to communicate [illegible] statisticians. (Do a few law courses qualify someone to be an attorney?) Moreover, as Hurlbert (1984) suggested, basic concepts of experimental design should be included in elementary courses and explained in concise, nonmathematical terms. In the private sector, statisticians should emphasize their ability to help contractors save money by helping them to create cost-effective, statistically sound designs. In the government sector, statisticians should play an integral part in the creation of any statutes that involve statistical tests. They can also emphasize the useful role that they can play by helping to provide scientific evidence to justify certain regulatory actions. In this age of environmental litigation, statisticians will be appearing more often in the courtroom to help defend the government's or industry's actions (see Meier 1986).

It has been more than 10 years since Boen and Smith (1975) called for the formation of an ASA committee to study whether statisticians should be certified. We are no closer to a certification procedure, and in many areas our profession still lacks the respect it deserves (Minton 1983). In light of the increasing role statistics plays in public welfare, we owe it to the public to assure quality control in our profession.

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N. PHILLIP ROSS*

1. INTRODUCTION

Dr. Millard's article provides a timely reminder to the statistical community that statistical methods as well as statisticians have not yet been totally accepted as essential components of environmental decision making. Most environmental program managers, analysts, and scientists agree that well-designed environmental monitoring systems are essential to making informed decisions. Therefore, it is difficult to understand why statistics has not become better integrated into the process of environmental program management and decision making. I believe that Dr. Millard touches on some aspects of this paradoxical problem. I would like to focus on two areas that I believe can provide additional insight: the socio-political process that affects environmental programs and the role of the statistician in working within this socio-political system.

2. THE SOCIO-POLITICAL PROCESS

Societal concern about our environment and its future is a major force in molding the direction in which our environmental programs will go. In the United States we often deal with these societal concerns by enacting laws that attempt to correct or regulate our perception of the causes. These laws are enacted through the political process, carried out by executive agencies, and interpreted by the courts. Green (1986) cited from a dissenting opinion of Justice Rehnquist in *American Textile Manufacturers, Inc.*, v. *Donovan* (1981): "Statutory law more often than not is based on emotion, politics, and compromise rather than on coherent principles that objective experts would regard as valid. . . ." Most of our monitoring programs are based on statutes enacted by federal, state, or local legislatures. As Chief Justice Rehnquist has said, they are often based on emotion, politics, and compromise—very subjective and not always amenable to the imposition of sound scientific design in the implementation process. In fact, many of the statutory requirements are so detailed they leave the implementing agencies very little room for monitoring design considerations (National Academy of Sciences 1977). This does not mean that the lack of flexibility in many of our environmental statutes totally excuses managers from using good design principles; however, it does mean that the ability of the program managers to use objective scientific approaches can be severely limited. They must operate within these limitations; they have no choice.

Dr. Millard has chosen an excellent example in Love Canal. It provides insights into how both political and social forces can impose themselves on what initially appears to be a scientific problem. The shortcomings in the Love Canal study, some of which Dr. Millard has cited, did not result from the lack of qualified statisticians participating in the study, nor were their recommendations totally ignored. Many of the shortcomings resulted from the attempt by EPA scientists to deal with the realities of the socio-political constraints that were imposed on the study.

For a variety of reasons, detailed by the EPA (1982), a series of events resulted in President Carter declaring on May 21, 1980, that a state of emergency existed at Love Canal. This led to the initiation of the EPA Love Canal monitoring studies. EPA site-sampling activities began on August 8, 1980, and concluded on October 31, 1980. The entire data-collection activity took place in less time than it would have taken to develop statistically valid sampling designs and to arrange for the logistical support to undertake the sample-collection activities. It would have been desirable to have had several months to just work on the study design; however, this was not possible. The political and social pressures demanded that visible federal action be taken immediately. We know that front-end planning would have eliminated many of the study's shortcomings; we know it now, and we knew it then. At the time of the "crisis," however, the socio-political pressures and constraints did not permit any other actions to be taken. The EPA (1982) described its Love Canal monitoring effort as follows:

> The monitoring program performed by EPA at Love Canal involved the collection and analysis of approximately 6,000 field samples, making the Love Canal study the most comprehensive multimedia monitoring effort ever conducted by EPA at a hazardous waste site. The precision and accuracy of the environmental measurements obtained were documented through application of an extensive quality assurance program. As a result, this study exemplifies the design and execution of a state-of-the-art environmental monitoring program. (p. iii)

The EPA's statement may seem surprising considering the documented comments in Dr. Millard's article. From the EPA's point of view, however, which includes an understanding of the socio-political realities under which the study was conducted, the field effort was exemplary and accomplished its purpose. Many of the problems could have been averted, even under the socio-political pressures existing at the time. Love Canal was the first project of this magnitude. Since Love Canal, there have been other projects and many of the problems cited by Dr. Millard have been eliminated. Unfortunately, as long as there are the inevitable socio-political pressures, a totally objective approach to the design and implementation of studies of this type is probably not possible. Statisticians must understand the nature of these pressures and how they effect the decision process. Decision makers cannot always wait for the ultimate study to be designed and executed. The decision maker lives in a world and culture different from those of the scientist. House and Shull (1985) pointed out that scientists and managers are trained in their own specialities. Their methods and techniques and even the ethos each develops are different.

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Scientists are trained to use logic and objective thinking; in contrast, decision making requires taking action with a minimum of information; often theories are modified with each new problem. Both are legitimate approaches; however, we must keep in mind that they serve different pur[illegible]s. Green (1986) quoted Philip Handler, then president of the National Academy of Sciences, regarding the EPA's decision on DDT:

> I have undergone the masochistic exercise of reading a considerable part of those hundreds of pages of testimony which were taken by the hearing examiner [who would now be called an "administrative law judge"]. . . . I say "masochistic" quite deliberately. Two-thirds of the so-called "scientific evidence" that I read could not have found acceptance by the editorial board of a reputable journal. The situation was summed up, I thought, in the remarkable words of the Administrator of EPA in the decision statement in which DDT was effectively banned for most purposes. As close as I can recall it, he said "DDT constitutes an unquantifiable hazard of uncertain nature." . . . I am not disagreeing with the decision itself. It is the basis for decision making, the inadequacy of the data, which I found so very troublesome. I still do. . . . (p. 222)

Green concluded by pointing out that "It is clear that Dr. Handler was unable to accept the legal culture" (p. 222).

Statisticians may not wish to accept the "legal culture" either; however, we need to understand that it is a way of thinking that strongly influences what is and what can be done in environmental monitoring programs.

3. THE STATISTICIAN IN THE SOCIO-POLITICAL ARENA

Marquardt (1987) defined the primary role of the statistician as that of a "purveyor" of the scientific method. Statisticians must become "entrepreneurial practitioners" and consultants for the scientific method. You cannot sit comfortably in your office and expect the managers and decision makers to come knocking on your door insisting that you get involved early enough to ensure that the scientific method will be followed and that the resulting information will be acceptable for the types of decisions that need to be made. Statisticians need to raise their concerns to their management and not wait for management's awareness of the problem to result from concern filtering up through the chain of command. Most managers want to know when they are heading for disaster; it is the obligation of their statistical staffs to help them become aware of impending disaster long before they reach a point of no, or not easy, return. The managers are operating under the forces of the socio-political environment. They are not going to seek out the statisticians; the statisticians must, if they want to have an impact on the decision making early enough in the process, seek out the manager. The statistician has to convince the decision makers that statistics can help them make better and more defensible decisions and that statistical thinking is not so rigid as to preclude the flexibility needed in decision making.

Statisticians must be careful not to fall victim to the "shoot the messenger" syndrome. To avoid being the bearer of bad news, you must be aware of what is happening and to try to anticipate where your expertise may be needed. Too often I hear the statement that I am only concerned with the statistical analyses, not the policy decisions. This is a very narrow view to take of one's responsibility; if the statistician is not aware of the policy context in which decisions are made, then it is doubtful that he or she will be given the responsibility of being concerned about the statistical analyses. If every time a statistician is asked by the manager to assist in the analysis or interpretation of imperfect data (usually data that you were not responsible for collecting), they respond by stating that there is nothing you can do to help—the data were not collected properly, or there is no time to design and implement a survey of that size—managers will stop asking statisticians for assistance. It does little good to point out errors in the analysis or inadequacy of the data after time and money (usually a great deal of both) have been expended and decisions are seconds away from being made. It may be true that what the information manager wants from the data or study may not be obtainable. But the problem may be amenable to a modified approach—some logical answer to the question may be possible or, perhaps, a different question can be asked. The statistician has the training and the ability to make these judgments and to define approaches that may not have the rigor of a classical design but nonetheless will provide a better answer than attempting to impose inappropriate or inadequate analyses on the data or data-collection activity.

Recently there have been some innovative approaches for dealing with imperfect sets of data. Patil, Rao, and Zelen (1985) and Hennemuth, Patil, and Taille (1985) introduced the concept of "encountered data" as a possible approach to dealing with observational studies in which the data do not fall into experimental or replicatable categories. The approach is particularly useful for environmental problems. More often than not we are faced with using available data rather than planning for the collection of new data. Innovative thinking and approaches of this type to environmental data collection and analyses should be an integral part of the environmental statistician's arsenal of tools.

4. IMPROVED TRAINING

Another area where improvement is needed is in the way applied statisticians are trained, which contributes to the problem of adjustment to the real world of applied statistics. McCulloch, Boroto, Meeter, Polland, and Zahn (1985) pointed out that many students have difficulty making the change from academia to government or industry. Statisticians tend to be trained as research scientists, most of whom are comfortable doing theoretical research or reviewing and commenting on the misapplication of theory. Applying the results of theoretical research to real world problems is difficult, however, and very little time, if any, is devoted to providing statisticians experience and training in real-world applications. Some attempts have been made to provide graduate students with training in the "art" of consultation. McCulloch et al. (1985) discussed an expanded approach to the education of statisticians being used at Florida State University, where courses on statistical consultation are offered as part of the curriculum. They found in their course-evaluation interviews with graduate students that the consulting courses had given them an opportunity to gain experience in actual consulting, to learn more about applied stical problems, and to learn how to work with "non- ticians." Carter, Scheaffer, and Marks (1986) strongly advocated the role that the consulting units in statistics departments play in providing an excellent opportunity for graduate students to receive on-the-job training in the practice of statistics. Unfortunately, the "practice" is often limited to consulting in the controlled environment of academia. Both of these articles discussed consulting experience under controlled situations. But there is nothing like the real experience of working in the government or an industrial setting. Statisticians should have this type of exposure during their academic training. Primary- and secondary-school teachers are required to take at least one semester of an internship during which they actually teach within a school system. They must take this internship before they can be certified to teach. If statistics departments could arrange for statistical internships and traineeships with government or industry, this would provide the student with pre-employment experience (i.e., help them decide what they want to do with the education they are getting) and, at the same time, provide feedback to the statistics department on the success of their training courses.

5. FEDERAL-AGENCY INITIATIVES

Dr. Millard's article provides a timely reminder that statistical methods as well as statisticians have not yet been totally accepted as essential components of environmental decision making, but it is important to note that there have been major improvements in statistical quality and statistician involvement in environmental monitoring programs in the last few years (particularly at the EPA). Keep in mind that the monitoring activities that Dr. Millard reviews in his article took place from three to five years ago. Many lessons have been learned from these experiences, and positive changes have been initiated in a number of environmental programs. The EPA has initiated a number of activities to foster better quality assurance and analyses of their environmental data. For example, in 1984 the EPA formally initiated a new and more rigorous agency-wide quality assurance program (EPA 1984). Through a process called Data Quality Objectives (DQO's) the EPA is working toward institutionalizing quality-assurance requirements for all programs. The DQO's will provide a basis for developing quality-assurance protocols for their existing and planned EPA environmental-monitoring activities. Oversight responsibility for this program resides in the EPA Office of Research and Development's Quality Assurance Management Staff and the EPA Office of Policy, Planning, and Evaluation's (OPPE) Office of Standards and Regulation. Both of these offices are staffed with highly qualified statisticians and technical experts. In addition, the assistant administrator for the OPPE has established a Statistical Policy Advisory Committee, which will provide policy guidance and advice to the assistant administrator on statistical issues and problems. This committee is composed of 25 senior-level statistical managers and statisticians from EPA program offices, laboratories, and regions. The committee represents a major step forward for statistics at the EPA, and the impact of its activities will be reflected in continued improvement [illegible] the way EPA deals with its environmental-monitoring and data-collection activities.

6. CONCLUSION

In conclusion, Dr. Millard demonstrates that there definitely is room for improvement in the use of statistics and statisticians in environmental monitoring; however, the rays of hope are far from dim. Statisticians need to recognize that environmental programs are functions of complex social and political forces. Once we recognize the socio-political pressures and how these constraints mold environmental programs, then we can carve out a meaningful role for statistics and statisticians that will provide the program managers and the public with the tools to make better and more informed decisions.

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Comment

BERTRAM PRICE*

1. INTRODUCTION

Dr. Millard identifies a serious problem that affects the ability of the U.S. Environmental Protection Agency (EPA) to carry out effectively the mandates of major environmental legislation. The problem is the failure of some (possibly many) environmental-monitoring programs to produce data containing information sufficient to support the types of analyses needed for making effective regulatory decisions. Millard focuses on statistical issues in environmental monitoring, demonstrating with three examples that statistical principles either are not used where needed or, if used, are often applied incorrectly. One of his major points, that statistical procedures based on data obtained from monitoring networks are used almost always without consideration of the power of the monitoring design network, is a particularly important criticism. There is little question that Type II statistical error rates are too often ignored when environmental-monitoring programs are being developed. Since most environmental-monitoring data are used ultimately in a statistical test (e.g., either testing compliance with a regulatory standard or determining if a change in pollution level has occurred) designs for data collection should be focused on the control of statistical decision error rates. Designing data-collection plans for monitoring programs that control the likelihood of Type II errors requires formal monitoring objectives to be stated. Environmental managers responsible for developing regulatory programs (and possibly even some statisticians) may be surprised to find that more attention devoted to controlling statistical error rates can lead to a unified approach for planning and implementing environmental-monitoring programs.

2. NATIONAL ACADEMY OF SCIENCES REPORT

This theme—developing formal objectives for environmental-monitoring programs and designing data-collection plans to control error rates—was addressed in some detail in the report prepared by the Study Group on Environmental Monitoring and published by the National Academy of Sciences (NAS, 1977). Chapter 3 of the report, "EPA's Management of Scientific Data," and Appendix C, "Incorporating Uncertainty Into Environmental Guidelines," prepared by J. Stuart Hunter, deal with problems in applications of statistics to environmental monitoring similar to those identified by Millard. (Millard's article would have more relevance if he had related his observations to those reported by the Study Group.) As discussed later in this comment, progress since 1977 toward solving some of the problems identified is apparent. Millard's examples, however, are a reminder that deficiencies in statistical practice applied to environmental monitoring identified in 1977 have not been eliminated. To place in perspective some of the criticisms, I have briefly summarized findings of the Study Group and noted a few important areas of progress.

The Study Group reported that "broad purposes must be taken into account in the design of monitoring networks. But designing a network that is cost-effective requires one to define specific operational objectives and criteria in advance" (NAS 1977, p. 23). Establishing operational objectives for monitoring may be easy in some situations and much more difficult in others, depending on the "broad purposes."

3. AMBIENT AND SOURCE MONITORING

The Study Group's classification of monitoring systems into two categories—ambient monitoring systems and source monitoring systems—reflects different "broad purposes." Ambient systems are intended to determine how well environmental standards are being met and how environmental quality is changing over time. Source monitoring systems are used to develop inventories of pollutants discharged to the environment and to test compliance of individual organizations with regulatory standards. An example helps clarify this classification system. Ambient water-quality standards limiting chemical concentrations in surface waters have been established under section 304(a)(1) of the Clean Water Act. An ambient water-quality standard consists of two parts—a designated use for which the water body is protected and a numerical pollutant concentration limit for that use. For example, the human health standard established in 1980 for phenol was 3.5 micrograms per liter. Ambient standards are translated into discharge limits for individual point sources such as industrial-waste streams from manufacturing facilities. Each facility has a maximum discharge limit specified in a permit. [The permits are issued under the National Pollution Discharge Elimination System (NPDES) program.] Ambient monitoring involves samples taken from the body of water to determine changes in pollutant concentrations relative to established water-quality criteria. Source monitoring involves samples taken from a specific waste stream to test compliance with a permit limit.

From a statistical perspective, source monitoring systems are easier to design than ambient monitoring systems because the objectives are specific—for example, testing compliance with a permit limit using a statistical test with values specified for the Type I and Type II error rates, and the minimum concentration above the permit limit that defines the Type II error. Ambient systems present a greater challenge. Ambient monitoring data are used in the same way as source monitoring data when testing against an ambient standard, but they are also used to establish baseline levels and to measure time trends for assessing the effects of cur-

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rent regulations or control methods. In addition, they are intended to assess, in the future, regulations that have not been implemented or, in some cases, have not been formulated.

4. PROBLEMS AFFECTING EPA MONITORING SYSTEMS

The Study Group indicated three reasons for the problems affecting EPA monitoring systems: (a) "the apparent lack of connection between the data EPA acquires and the decisions the Agency makes," (b) quality assurance practice that is "often inadequate to guarantee that the data produced will be accurate and relevant to decision making," and (c) "the scarcity of statistical talent within the Agency" (NAS 1977, p. 63). The Study Group was more specific in its criticisms of environmental sampling and chemical analysis, which are components of a monitoring system. Regarding sampling, it identified the need for "a central point of scientific responsibility for sampling protocols; network designs; processing and audit of sampling activities; and the preparation of guides, instructions and standards" (NAS 1977, p. 66). Regarding chemical analysis, the Study Group expressed concern that no estimates of bias and precision existed for many of the EPA's reference measurement methods and that ruggedness testing, which is conducted according to a formal experimental design to investigate consequences that small changes in analysis protocols have on the resulting measurements, was not used often enough. Furthermore, the Study Group called for interlaboratory comparison programs, noting the necessity of these programs to control the quality of analytical data used in major regulatory initiatives such as the tens of thousands of NPDES permits issued to limit discharge of pollutants into the nation's waters. The Study Group also called for a certification program based on performance for laboratories that, by performing measurements, determine whether industries and state and local governments are complying with standards established in all EPA programs. Effective resolution of most, if not all, of these problems integrally involves statistical concepts and the need for statistical design.

5. FEDERAL-AGENCY INITIATIVES

Have EPA monitoring programs and the role played by statistics improved since the report was written? Notwithstanding Millard's three examples, progress in some areas is apparent.

In 1982 the EPA adopted a broad set of quality assurance (QA) guidelines requiring, among other things, the preparation of a QA Program Plan for every large EPA contract issued for environmental data collection and for each specific project that involves environmental data collection. These QA plans are intended to be comprehensive, covering in operational detail project organization and responsibility, sampling design including sample specifications, sample-collection protocols, statistical sampling specifications, and analytical measurement protocols including quality control, such as the analysis and interpretation of replicates, blanks, and referee laboratory samples. The general QA objective is to collect data with quality sufficient for the intended application. Statistical concepts such as bias, precision, sample size, Type I and Type II error rates, and minimum detectable difference must be addressed explicitly if the QA objective is to be realized.

In a related action, in 1984 a program was apr[illegible]d requiring data quality objectives (DQO's) to be estab[illegible]d for all environmental-monitoring and data-collection programs undertaken by the EPA. As in the QA program, the guiding principle for data quality is to produce data sufficient for the intended application. DQO's address characteristics of the raw data and summary statistics based on the raw data including bias, precision, representativeness, and statistical decision error rates when the data are used for testing compliance with a regulatory standard.

Regarding the standardization and testing of reference measurement methods, in 1986 the EPA drafted guidance for analytical-method development and validation. Development and validation activities, which are to be completed before an analytical-measurement method is released for use in a regulatory monitoring program, include ruggedness testing, conducting an interlaboratory study, and estimating the method's bias and precision. Prior to 1986, the EPA took action to improve control in the NPDES permit program, a program specifically addressed by the Study Group, by conducting a series of interlaboratory studies of the analytical methods needed for the program. The EPA developed a laboratory qualification program to screen laboratories intending to analyze samples to determine NPDES permit compliance, and it established a laboratory performance program to monitor ongoing performance of labora[illegible] that pass the qualification test. In addition to these acti[illegible]s for the NPDES permit program, the EPA has implemented laboratory qualification and ongoing performance testing in the Contract Laboratory Program, which is a network of laboratories under contract to the EPA to analyze samples taken at hazardous-waste disposal sites that are being considered for cleanup under "Superfund" legislation.

Each of these three actions indicates improvements affecting environmental-monitoring programs in areas criticized by the Study Group. In addition, each of the actions requires substantial statistical involvement. Nevertheless, Millard's examples provide strong evidence that statistics still is not always used effectively.

6. ADDITIONAL EPA CONSTRAINTS

In 1977 the Study Group listed a number of reasons why statistics had a limited effect on monitoring programs. Included were the following:

> (a) the number of professional statisticians in the Agency is too small; (b) there is no professional focus of statisticians, and statistical expertise is scattered throughout the Agency; (c) responsibility for establishment and maintenance of good statistical practices is uncoordinated; (d) no statistician with EPA has sufficient rank to influence Agency decision[illegible] delay them on the basis of statistical deficiency; (e) no statistic[illegible] statistical group within the Agency can consider the whole range of statistical concerns related to environmental problems in order to decide where statistical expertise could be brought to bear most effectively or to serve as statistical advisor to the Agency's top management. (NAS 1977, p. 95)

The Study Group also made a broad recommendation that "EPA develop . . . talent of sufficient quantity and character to meet its many statistical responsibilities and that the Agency establish at least one senior statistician to advise EPA management on the entire range of Agency's statistical concerns" (NAS 1977, p. 96).

7. IMPROVING COMMUNICATION

The Study Group looked inside the EPA for reasons and solutions. Millard's assessment and recommendations are primarily focused outside EPA. His assertion that "Many introductory courses and textbooks in statistics do not emphasize the concepts of power and experimental design" (p. 252) and his recommendation that "basic concepts of experimental design should be included in elementary courses and explained in concise, nonmathematical terms" (p. 252) need to be considered seriously by the teaching community. This is one way to help those developing regulatory policies to recognize the importance of statistics in environmental programs. Of equal or perhaps more importance, the consulting statistician must take the responsibility for communicating, in terms understandable by regulators, chemists, and environmental scientists, the role of statistical design principles in setting objectives and providing efficient solutions to problems of environmental regulation.

Ten years have passed since the Study Group completed its report. The EPA has recently developed new concepts and implemented new approaches to improve the quality of environmental-monitoring programs. Another formal review of environmental monitoring is justified at this time. The review should not be limited to evaluating progress relative to previous recommendations, but it should provide guidance for the effective application of statistics in the continuing development of meaningful and efficient monitoring systems for the future.

ADDITIONAL REFERENCE

National Academy of Sciences (1977), *Environmental Monitoring: Analytical Studies for the U.S. Environmental Protection Agency* (Vol. 4), Washington, DC: Author.

REYNOLDS ALUMINUM
Reynolds Metals Company • PO Box 27003 • Richmond Virginia 23261

Dept. of En[illegible]
RAY BROOK [illegible]

December 17, 1987

EMERY EXPRESS

Mr. James Ludlam
New York State Department of Environmental Conservation
Bureau of Remedial Action
50 Wolf Road, RM 222
Albany, New York 12233-0001

RE: York Oil Site - Moira, New York

Dear Mr. Ludlam:

Reynolds Metals Company has reviewed the Addendum Feasibility Study Report on the York Oil Company site, dated November, 1987, and has the following comments to offer:

1. The data contained in this report, along with that of the RI/FS done in 1985, shows that a substantial number of sediment and soil samples were analyzed for PCBs. However, of the 266 samples analyzed, only 9 had concentrations above the 50 PPM level that both the State of New York and the EPA use as a criteria for hazard determination. The States arbitrary selection of the 10 PPM cleanup policy goal at this site is thus in question, what with other superfund sites in the State using the more normal 50 PPM PCB as a remedial action level (specifically the Hudson River sites, where PCB hotspots above 50 PPM were remediated by removal).

New York State's 10 PPM PCB cleanup policy dramatically increases the cost of the York Oil cleanup, by increasing the amounts of soils alleged to be contaminated. This is evident in the soil volumes estimated necessary for excavation, now at 30,000 cubic yards, up from the 2,700 cubic yards in the original 1985 RI/FS.

A more practical approach would be to just excavate the hotspots above 50 PPM, as has been successfully done at other superfund site cleanups, with the same overall risk minimization to the public. This approach would act to keep the costs of any remedial action down to a more reasonable level, and would adequately protect the public from any perceived danger at this site.

2. The Agency has selected as it's preferred alternative the option labeled "5C", an approach utilizing soil excavation, solidification, and groundwater treatment. Nowhere in the addendum study does Reynolds find any cost breakdown of the solidification process.

In fact, Reynolds has serious reservations about the cost estimates that the EPA has developed for this alternative. Specifically, page 6-74 gives the cost for excavation and solidification as being $2,746,800. Using the EPA's soil quantity estimate of 30,000 cubic yards, one arrives at an average figure of $91.56 per cubic yard for both excavation and treatment. On page 5-32 of the 1985 study, the Agency itself says that excavation costs range from $50 - $60 per ton. Reynolds has had some contact with solidification companies, and has never seen a quote as low as the $31 per ton figure that is left over after the costs for excavation are subtracted out.

Reynolds feels that the costs for option 5C are understated, especially for the solidification end of the process.

3. The PCBs that the EPA has identified in all the studies of the York Oil site are PCB 1248, 1254, and 1260. As pointed out in the recent study commissioned by the State of California, these aroclors are not considered to be carcinogenic to animals, or to humans.

Specifically:

Aroclor 1260 - "The human evidence for carcinogenicity of this compound is inadequate."

Aroclor 1254 - "The human evidence for carcinogenicity is negative."

Aroclor 1248 - "The human evidence for carcinogenicity is negative."

Since these compounds are the ones discovered at the York Oil site, their lack of carcinogenicity can be used as a basis for the 50 PPM cleanup goal being chosen.

4. Page 2-4 of this addendum states that the EPA conducted a cleanup of the site in 1981, where soils from the wetlands and sediments from the lagoons were solidified with cement and cement products and left onsite. Reynolds questions why these materials have to be excavated again for the solidification treatment, if they have already undergone the process.

If you wish to have additional information on these comments, feel free to call our Mr. S. D. Ryan at (804) 281-3952.

Sincerely,

S. D. Ryan /for

Lawrence C. Tropea, Jr. P.E.
Director, Environmental Control
Corporate Environmental Department

LCT/SDR

cc: Keith Teel - Covington & Burling
Robert Howe - U. S. EPA

ALUMINUM COMPANY OF AMERICA
ALCOA BUILDING
PITTSBURGH, PENNSYLVANIA 15219

LEGAL DEPARTMENT

ALCOA

December 17, 1987

VIA EXPRESS MAIL

Mr. James Ludlam, Project Engineer
New York State Department of Environmental
Conservation
Bureau of Remedial Action
50 Wolf Road - Room 222
Albany, New York 12233-0001

Re: York Oil Site, Moira, New York - Addendum Feasibility Study

Dear Mr. Ludlam:

Attached are the comments of Aluminum Company of America to the Addendum Feasibility Study prepared for the York Oil Site. A copy this letter and the attachment is also being sent to Mr. Robert Howe, EPA's Project Manager. By separate letter we are also transmitting a copy of these comments to Ms. Elena T. Kissel, EPA's Assistant Regional Counsel, and, in that letter, have requested a meeting between DEC/EPA and Alcoa to discuss the proposed remediation. We therefore request that the comment period be extended until at least such time as a meeting can be held. If you have any questions concerning these comments, please feel free to contact me at (412) 553-4259.

Very truly yours,

Ralph W. Waechter
Attorney

Attachment

RWW/mit
117RWW

cc: [redacted]

ALUMINUM COMPANY OF AMERICA
ALCOA BUILDING
PITTSBURGH, PENNSYLVANIA 15219

LEGAL DEPARTMENT

December 17, 1987

VIA EXPRESS MAIL

Ms. Elena T. Kissel
Assistant Regional Counsel
Office of Regional Counsel
United States Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

Re: York Oil Site, Moira, New York

Dear Ms. Kissel:

Enclosed for your convenience is a copy of the comments of Aluminum Company of America to the draft Addendum Feasibility Study for the referenced site.

With regard to this site and the Addendum Feasibility Study and the Agency's decision making process, I would like to request that representatives of EPA and NYSDEC meet with representatives of Alcoa to discuss the Consultant's report and recommendations and EPA's and DEC's recommended remediation. We are free to meet at any time prior to issuance of a ROD. We anticipate that such a meeting will benefit the agencies in their decision making and request that additional comments offered by Alcoa at such a meeting be included in the administrative record on this matter. In that regard, we request that the comment period be extended until such time as we are able to meet. Please contact me at (412) 553-4259 so that we can discuss mutually convenient dates.

Very truly yours,

Ralph W. Waechter
Attorney

Attachment

RWW/mit
116RWW

ALUMINUM COMPANY OF AMERICA'S COMMENTS ON THE DRAFT ADDENDUM FEASIBILITY STUDY FOR THE YORK OIL SITE, MOIRA, NEW YORK

I. GENERAL COMMENTS

1.43

SWskin 1.65E-1

10 mg/kg
carcinogenic risk
Soil Ing 4.3E-5
Soil skin 8.25E-6
GW 1.26E-08
SW 7.35E-4

1. EPA's 1984 Draft PCB Cleanup Policy is referenced throughout the Report. This Policy was never adopted by EPA and is now obsolete. The Agency issued a final rule establishing a National PCB Cleanup Policy on April 2, 1987 (52 Fed. Reg. 10688). The most recent Final Policy should be referenced and applied. It should be noted that the Agency's present cleanup level for soils in low contact, restricted access area is 25 ppm.

Other than stating that it is a DEC "action level", the Report gives no basis for choosing a 10 ppm clean-up level. The scientific and environmental basis for choosing this level, or any level, should be discussed and documented.

3. The groundwater ingestion risk assessment employed a 26.9 ppm PCB concentration. Risk assessment for surface water accidental ingestion used a 120 ppm concentration. Each of these values are orders of magnitude above the PCB solubility limit, as referenced in the Report. It appeared, therefore,

that if these are valid samples, they are actually samples of "free oil". Indeed, Sample YO-DSW in Appendix C is labeled as an "oil" sample at 120 ppm not as surface water. Only one surface water sample is stated in the data - the water phase of Sample YO-DSW at a concentration of 0.014 ppm. Additional data on surface and groundwater PCB levels is necessary to perform a meaningful and scientifically justifiable risk assessment.

4. Because zinc will not be regulated as a drinking water standard by EPA, using zinc as a factor in any of the risk assessments is inappropriate.

5. The most recent literature on PCB carcinogenicity (e.g., that of Dr. Stephen Roberts, a University of Arkansas Toxicologist) indicates that only those isomers of PCB with 60% or greater chlorine content are suspected carcinogens. The majority of PCB isomers found at the site are Aroclors 1242 and 1248. In light of the recent scientific findings, only Aroclor 1260 should be used in cancer risk assessments. Such an approach would follow that employed in California's Proposition 65.

6. An assumed gastrointestinal adsorption of 100% was applied in assessing the risk of drinking PCB

contaminated groundwater. The assumed dermal adsorption factor for organics was 50%. More realistic and appropriate factors for gastrointestinal and dermal adsorption are 15 to 30% and 1% respectively. For further information on the appropriate adsorption factors, Dr. Renata Kimbrough, formerly of the CDC and now with U.S. EPA-HQ, an expert in this area, should be consulted.

II. SPECIFIC COMMENTS

1. Executive Summary, Page 2 - Top of Page - "Alternative No. 5A was ranked highest based on non-cost criteria." Feasibility Studies require cost evaluation for each alternative. What then is the significance of this statement?

2. Executive Summary, Page 2 - Bottom - Until the contamination pathway RI/FS is performed the Erdman, Anthony ("EA") recommendation that "on- and off-site remedial action be completed at the same time" is suspect and not supportable.

3. Page 1-1 - The site is located near Moira, not in the Town of Moira. The last paragraph suggests that more than one report is to be referenced, but only one is listed.

4. Page 1-1 - Last Paragraph - The preparer of the RI Report should be identified.

5. Page 2-1 - Does the Report include information from groundwater wells installed earlier, or only the 57 new wells? If none of the earlier data was used, why not?

6. Page 2-2 - The results of field screening using the portable GC should be, but are not, discussed in the Report.

7. Page 2-2 - First Paragraph - The "Site Exploration and Conditions . . ." is incorrectly dated. That Report is dated October, 1987.

8. Page 2-3 - Paragraph 2 indicates that lab data from the 1985 Study are not included. However, it appears that only selected results from the 1985 Study are mentioned in this Report. What was the criteria employed in selecting the data to be included?

9. Page 2-4 - Paragraph 5 suggests that cleanup activities have continued since 1981. The systems installed at that time have not been maintained and were essentially non-functional as early as 1985.

10. Page 2-5 - Graphics would help this subsurface discussion.

11. Page 2-6 - First Paragraph - How many is "many"?

12. Page 2-6 - Observations were made about oil and oil staining. How are these terms defined? How much oil is needed to be "oil" rather than oil stained?

13. Page 2-7 - This table contains clearly subjective observations rather than measurements. It should be so stated and the terms "oil soaked", "oil sludge", "oil and oil staining", and "oil pockets" should be defined. Also, the term "possible oil stains" is confusing.

14. Page 2-7 - Boring number YO-17A, depth and elevation do not agree for 23.0-24.0 and 382.7 and 380.7.

15. Page 2-7 - and 2-8 - Under remarks - What does EA mean by "suspected" and "possible"?

16. Page 2-9 - Paragraph 3 - States that the flow from the mound is generally radial but states that the flow is generally from the North. What does this mean? Paragraph 4 states that there is a bedrock groundwater divide immediately north of the site.

17. Page 2-11 - The basis for the determination that the groundwater flow from the site is only 10-15 GPM is not clear.

Which report is discussed in the first paragraph of section 2.03. It contains 37 individual chemicals found at the site. Two aroclors are mentioned, but the appendix to this report mentions that three were found.

18. Page 2-11 - Third Paragraph - PCB aroclors need to be identified. (They are not listed on Table 2-3 either.)

19. Page 2-13 - The MCLG for PCBs is listed as 0, but no MCL is listed.

20. Page 2-15 - Paragraph 2 - Mentions widespread surface water contamination. However, the data set suggests that only one or two surface water samples were analyzed. How can widespread contamination be determined with so few samples?

The term "hotspots" is used to describe areas of PCB contamintion. This term should be defined.

definition

The last paragraph discusses how insoluble materials are moving through the groundwater system. It is generally believed that insoluble materials move extremely slowly, if at all, in a typical groundwater system. Oil and PCBs will probably not move with the water, and perhaps will not move at all.

21. Page 2-15 - First Paragraph - "Apparently" should be eliminated.

22. Page 2-15 - Second Paragraph - How long is "long"?

23. Page 2-16 - The statement is made that the water soluble components tend to sink . . . What is the basis for this statement?

24. Page 3-1 - The term "hotspot" is used at the bottom of the page.

25. Page 4-1 - At the bottom of the page a statement is made that "It has been established that PCB levels in the 0-10 ppm range, should be managed to eliminate direct human exposure. . . . This is not in accord with the EPA most recent and final cleanup policy that calls for spill cleanup and to various levels . . . some above 10 ppm.

26. Page 4-1 - This table is the same as Table 2-3.

27. Page 4-2 - Paragraph 1 states that it is anticipat that the cleanup limits will approach the lower end of the established limits. What is the basis for this determination . . . particularly since the indications are that surface water does not contain contaminants and that the groundwater in the usable zone is not impacted?

Borings YO-54 and YO-32 are mentioned as having PCB levels above the action level. However the data in Appendix C show that the levels found are not above the 10 ppm action level.

Paragraph 3 suggests that data is available to draw contours of PCB contamination, yet the data are not included in the report. It discusses areas where it is suspected that PCB contamination may have occurred. Such speculation has no place in this type of report. Data are needed to support major decisions, not speculation. The writer also refers to Appendix A and B which are boring logs, not test data.

28. Page 4-3 - Top of Page - This doesn't make sense. How and why will PCB concentrations in the 0 - 10

ppm range be ~~elevat~~evaluated during cleanup? What established limits are referred to in the last sentence?

29. Page 4-5 - The data presentation in Table 4-2 is unsatisfactory. In addition to the high and low values, it would be helpful and appropriate to present the average of all samples taken. It would also be helpful to have all the results tabulated in an easily understood table. Evidently, at least 60 soil samples taken at the site showed zero contamination of PCBs, and many showed levels that were only slightly above the detection limits.

30. Page 4-6 - Paragraph 3 - It is stated that the 1985 study determined that the oil sludge layer may be serving as a reservoir for potential contaminants. However, the data presented in this report do not seem to confirm that. The soil samples indicate that the PCB levels are below the 50 ppm level and that the sludges pass the EP Toxicity tests (top of pp 4-6). Shouldn't this be mentioned? In Paragraph 3, reference is made to PCB levels in surface water of 120 ppm. This is impossible since PCB solubility in water is at least three orders of magnitude less. This should be reported as PCB levels in oil.

31. Page 4-8 - Since only one water sample is involved in this table, why is a frequency number included in Table 403.

32. Page 4-9 - A "plume" of phenolic contamination is discussed in Paragraph 4. However, the number of samples available seem to be inadequate to define a "plume". Table 4-4 suggests that phenol was detected in only one of nine groundwater samples analyzed.

33. Page 4-13 - In Paragraph 1, the "worst case" scenario approach is described. However, it seems inappropriate to use a concentration (31.5 mg/kg) found 20 feet below the ground surface as the "worst case" surface soil concentration for ingestion risk analysis. Likewise, it seems inappropriate to use an oil sample (120 ppm) as the basis for a "worst case" water ingestion or water contact risk analysis. Realistic samples should be used in these scenarios.

34. Page 4-15 - The last sentence of the paragraph before Section 4.03.022 discusses PCBs as a class. Recent statements by EPA officials indicate that the Agency does not fconsider PCBs as a class, but rather as a series of compounds with widely varying

degrees of toxicity. PCBs with more than 60 percent chlorine are considered to be toxic (i.e., Aroclor 1260) while PCBs with less chlorine (i.e., Aroclors 1248, 1252) are of less concern.

35. Page 4-16 - In Paragraph 2, the indicator scores should be based on realistic samples, not worst case numbers such as a sample found 20 feet below the surface.

36. Page 4-18 - The 31.5 mg/kg concentration for sils is from a sample 20 feet below the surface. It should not be used for soil ingestion risk analysis.

37. Page 4-20 - The 26.9 mg/l PCB concentration for groundwater is not realistic for two liters of consumption per day. The sample is obviously contaminated with oil and would not be used as a constant drinking water source.

38. Page 4-22 - PCBs are listed as a probable human carcinogen. There is not data to suggest this. It should be listed as a suspected human carcinogen or as an animal carcinogen.

39. Page 4-25 - This is the same as Table 2-4.

40. Page 4-28 - In Paragraph 3, it is noted that PCBs were found in 43 percent of the soil samples analyzed. It should also be noted that the average level in all samples with PCBs detected is less than 3 mg/kg.

In Paragraph 4, the concentration found in one sample, 20 feet below the surface is used for surface soil ingestion risk analysis. This is inappropriate.

41. Page 4-30 - In Paragraph 5, a groundwater concentration of 26.9 mg/l is used as the basis for ingestion risk analysis. This sample was obviously contaminated with oil since the level is at least 100 times the solubility limit for PCBs. It is an inappropriate sample to use for risk analysis.

42. Page 4-31 - At the bottom of the page, a PCB level of 120 mg/l is selected for worst case surface water risk analysis. However, the data in Appendix C clearly note that sample as an oil sample, with the associated water sample containing 0.014 mg/l PCBs. It is inappropriate to use the 120 mg/l concentration for surface water risk analysis.

43. Page 4-33 - In Paragraph 2, the possible exposure of people who work in the town garage is mentioned. However, since the town garage is a maintenance facility for motorized equipment, oils with high lead, other metals and phenol content will be present in and around the facility. Exposure to workers and visitors to the garage will probably be much higher from the activities in that facility than from this site.

44. Page 4-36 - In Paragraph 4, mention is made of risks associated with ingestion and dermal absorption of contaminants in on-site soils. Yet, in Paragraph 2 on Page 4-35, the writer concludes that the presence of contamination in the subsurface soils prevents the release of site contaminants as particulate matter, effectively eliminating potential inhalation exposure and minimizing the potential for direct contact with or accidental ingestion of soil. In spite of this, soils found at a depth of 20 feet were used in the ingestion risk analysis.

45. Page 4-37 - The concept of using water on the site as undiluted drinking water is introduced in Paragraph 2. This seems inappropriate since there are no surface intakes for many miles from the site.

46. Page 4-38 - Section 4.03.034 begins by stating that the maximum contaminant concentrations detected in samples were used. Only appropriate samples should be used.

47. Page 4-40 - In Paragraph 1, it is stated that observed maximum concentrations for various compounds exceed the ARAR by at least 600 times. It should be noted that the PCB concentrations used are in oil, while the ARARs cited are for water. If the water sample concentrations were used the ratios for PCBs would be several orders of magnitude less.

48. Page 4-41 - Zinc should be removed from Table 4-11 since it has been dropped as a compound in drinking water standards.

49. Page 4-42 - The PCB concentration in the surface water sample was reported as 0.014 mg/l not 120 mg/l as shown. The zinc number is reported as 0.088 mg/l not the 0.88 mg/l concentration shown.

50. Page 4-43 - Same comments as Page 4-42.

51. Page 4-48 - Dr. Renate Kinbrough of the Center for Disease Control suggests that gastrointestinal

absorption should be 15-30 percent rather than the 100 percent rate assumed.

52. Page 4-49 - Same comments are Page 4-48.

53. Page 4-51 - The carcinogenic potency factor for PCBs is listed as 4.34. This seems high for a suspected carcinogen. What is the basis for that factor?

54. Page 4-59 - In Paragraph 1, the estimated risk range of 10^{-4} to 10^{-7} is noted as the range that may be considered to be a public health concern. Normally, a risk smaller than 10^{-6} is considered acceptable. What is the basis for the selection of the range 10^{-4} to 10^{-7}?

55. Page 4-60 - Paragraph 2--Lifetime cancer risk estimates for arsenic, PCBs and trichloroethylene are within the target risk range only if the worst case assumptions include the errors pointed out earlier concerning assumed absorption factors, the use of oil samples rather than water samples and the use of sample data collected at a depth of 20 feet to represent surface soil conditions.

56. Page 5 - 47 - Third Paragraph - EA has assumed that there will be clean up associated with the pathway study, duch an assumption is inappropriate at this time.

57. Page 5-49 - Alternative 4 calls for a total of 52 groundwater extraction wells. However, the report concludes that the total groundwater flow from the site is 14 gpm. The number of wells specified seems very large for this type of flow system.

58. Page 5-50 - Last Sentence - A recommendation of thermal treatment, when treatability studies haven't been conducted, is wholly inappropriate and unsupportable.

59. Page 5-52 - Last Sentence - Same comment regarding treatability studies.

60. Page 6-1 - The referenced FS document is outdated. A June 1986 edition is available.

61. Page 6-60 - Paragraph 2 discusses the New York DEC Law that regulates materials containing PCBs in excess of 50 ppm. It should be noted that only some surface sediments (probably from the oil spill which occurred when the tanks were overturned at the site) contain PCBs in excess of 50 ppm.

62. Page 6-61 Paragraph 1 speaks of the EPA cleanup policy for residential areas. It should be noted that this policy refers to residential areas where people live nearby and have direct access, such as homes with utility poles nearby. Sites with controlled access, such as fenced areas, are considered non-residential. The York Oil site would be considered non-residential under the EPA policy.

63. Page 6-61 - Paragraph 2 states that PCB levels on and adjacent to the site are above 50 ppm. The report indicates that the maximum soil sample was 31.5 mg/kg, the maximum groundwater sample was 26.4 mg/l and a surface water sample, when analyzed for oil and water separately showed 120 ppm PCB in the oil and 0.014 ppm in the water fraction. (The surface water sample was taken from a location off the site.) Therefore, it can be concluded that soils and water on the site are not contaminated above the action limits for PCBs, and that only the sediments in the drainage areas resulting from an oil spill sppear to be contaminated.

64. Page 6-62 - Reference is made in Paragraph 2 to the EPA Draft PCB Cleanup Policy. That draft policy has

been superseded by a formal cleanup policy. The formal policy should be referenced here.

65. Page 6-72 - Cost estimates are difficult to challenge without detailed study. However, the cost estimate to excavate, incinerate and backfill 30,000 cubic yards of moist soil for $9,165,000 seems very modest. If this represents 50,000 tons of material, the estimated cost is $183 per ton. Incineration costs alone usually range above $500 per ton for materials with low or no BTU value. More details on the cost estimates should be provided.

66. Page 7-8 - Second Paragraph - Under cost comparison, Alternative No. 5A is 2-1/2 times as expensive as the least expensive alternative.

III. COMMENTS ON REPORT "SITE EXPLORATION AND CONDITIONS" PREPARED BY GOLDBERG-ZOINO ASSOCIATES

1. Page 10 - If sediment samples were collected in one foot intervals, were steps taken to prevent cross contamination when the sample tube was withdrawn between intervals?

2. Page 11 - Are the results of the field tests for PCB recorded in the report?

3. Page 14 - The statement is made that moisture content estimates were made in the soil and sediment samples, and that the estimates were purposefully made higher because high estimates would make the PCB content results higher as well. Such procedures are inappropriate and reduce the credibility of the results.

4. Page 17 - Reference is made in Paragraph 2 to the fact that during the current and previous field activities by GZA, this system (a filter chamber near the outlet of Lagoon 3 to collect oils exiting Lagoon 3) was generally free of water with no oil visible on the sorbent pad. This statement suggests that the contamination found in the drainage areas is from an earlier oil spill and not from the release of contaminants from the material currently in the fixed lagoons.

5. Page 23 - The different between oil and oil-stained soils is unclear. These terms should be defined.

6. Page 31 - The method used to determine soil and sediment moisture should be stated in the last

paragraph, since PCB levels are mentioned. If the soil or sediment moisture contents are off by a factor of two, the PCB levels will be off by that same factor.

7. Page 32 - Paragraph 2 states that boring Y054 showed PCB levels of 20 mg/kg. The table in Appendix C shows ND and BDL as the levels measured by GZA. The split spoon data also indicate ND levels of PCB in this boring.

8. Page 32 - Paragraph 2 stated that boring Y032 showed PCB levels above 10 mg/kg. The data in the first table of Appendix C indicate that the surface sample showed a level of 10 mg/kg and that all other levels were less than 5 mg/kg. No samples greater than 10 mg/kg were reported.

9. Page 32 - There is no basis for the statement at the bottom of the page that "it is assumed that much of the former Lagoon 3 contains PCBs greater than 10~~µ~~mg/kg." The evidence is to the contrary. The referenced sample, boring Y015 (not available in this report) evidently showed some PCB contamination in the surface sample, but essentially none in the sample below the cap layer.

10. Page 33 - Paragraph 3 attempts to describe possible analytical problems associated with the CLP test procedures used for PCB determination. If appropriate spiked were used and spike recoveries were within acceptable limits, the test results should be valid. If not, the results should be invalidated, not speculated as being too low.

Paragraph 4, same comment as above.

11. Page 38 - The PCB levels reported in the monitoring wells are obviously not possible in water. Therefore, oil must have been present. Is there any information on how the samples were collected (were the wells bailed fully), how much oil was present in the samples, and were the oil and water fractions analyzed separately?

12. Page 39 - In Paragraph 1, the writer speculates about the "PCB plume." However, he fails to state the very likely possibility that since almost all the detected PCB contamination is on or near the surface, the PCBs at the site came from the oil tanks which were tipped over and emptied by unknown persons after the site was abandoned by Mr. Pearce.

The evidence points toward a surface oil spill as the source rather than PCB contamination in the lagoons.

13. Page 47 - Conclusion 5 states that contaminated soils are predominantly in the south central portion of the site covering former Lagoon 3. This conclusion seems to be based on comments on Page 32, Paragraph 1, which refer to PCB levels in boring Y039 to a depth of six feet. However, the data in Appendix C indicate that duplicate tests of the deep samples in Y039 showed 17.3 mg/kg by ERCO and 0.5 mg/kg by GZA. At best, the numbers should be averaged, which is then below the action level. Actually, the data should be disregarded. Certainly, it should not be the basis for a conclusion.

14. Page 48 - Conclusion 7 speaks of PCBs found in Y052 from 7-12 feet. However, the data in Appendix C indicate that the PCB levels in Y052 in samples S-4 (6-8 feet), S-6 (10-12 feet) and S-9 (16-18 feet) were all below 5 mg/kg. This should be clarified.

15. Page 50 - Conclusion 8 discusses a "plume" of PCB contamination in the shallow groundwater. The implication is that the "plume" has a PCB

concentration of 120 mg/1. However, only one oil sample, collected in a drainage trench, was at that level. How can that sample be used to define a "plume?"

16. Page 50 - Conclusion 8 discusses a phenol plume that appears to sink as groundwater flows to the south across the site. Insufficient information is presented to support this conclusion. Only one groundwater test of the nine reported contained any phenol.

17. Page 52 - Paragraph 4 under limitations appears to imply that the writer's confidence in the data is limited. If this is the case, appropriate caveats should be included in the report.

John W. Johnson
County Manager

OFFICE OF
FRANKLIN COUNTY MANAGER

Court House, Malone, New York
Phone: (518)483-6767 Ext. 265

January 13, 1988

RECEIVE
JAN 14 1988
Dept. of Environmental Conservation
REGIONAL ENGINEER

Mr. Daniel L. Steenberge
Senior Sanitary Engineer
NYS Dept. of Environmental Conservation
Route 86
Ray Brook, New York 12977

Dear Mr. Steenberge:

The Franklin County Legislature has had the opportunity to review both Department of Environmental Conservation and Environmental Protection Agency's remedial plans for clean up of the York Oil Company Hazardous Waste Site located in the Town of Moira.

Resolution No. 5 passed by the County Legislature on 1/7/88 outlines their recommendation. Specifically the County prefers removal of all hazardous materials from the site as the first option. DEC's proposal for on-site thermal treatment is our second preference; providing heavy metals are not present in the soil. The EPA recommendation for solidification is the least preferred of the three options.

We are concerned that solidification does not reclaim the soil but simply solidifies the hazardous material. The site still remains hazardous. The residents in the area must still be neighbors to hazardous waste and the County will forever hold title to this unattractive plot of land. What future liability will the site pose to the County? Does EPA intend to relieve the County of all liability associated with the hazardous material stored in a solid state on County owned property? These questions need to be answered before any option is chosen.

Very truly yours,

JOHN W. JOHNSON
FRANKLIN COUNTY MANAGER

JWJ:rtm

Enc.

RESOLUTION NO. 5

Offered by Legislators Donaldson, Frenette, Jackson, McCann Poupore. Jones & Smith

Relating to York Oil Site Decontamination Procedures

WHEREAS: The York Oil Site has been for years a major concern of local, state and federal authorities because of the contaminated material deposited there; and

WHEREAS: Several methods of detoxification have been proposed including removal from the site, thermal treatment and solidification; and

WHEREAS: Removal from the site is no longer on the options list and the Department of Environmental Conservation believes that thermal treatment would be the best alternative as it would allow the site and surrounding area to be environmentally safe whereas solidification would render the site useless and it would in fact remain a hazardous waste site exposing the County and its citizens to possible adverse environmental and liability questions; and

WHEREAS: The liability problem of the York Oil Site has already caused an insurance company to cancel the County policies; and

WHEREAS: The people of Franklin County and particularly those in the Township of Moira deserve to have their community restored to an environmentally safe place to live; NOW, THEREFORE, BE IT

RESOLVED: That the Franklin County Board of Legislators requests that DEC and the EPA accept the alternative that involves thermal treatment in the event removal is no longer a viable option; and, be it

EXHIBIT III

EXHIBIT III

Comment:

A series of questions dealt with the quality of the area's groundwater and the water obtained from residential wells, potential future impact on the wells and the need for residential water supply in the area immediate to the York Oil Site.

Response:

All sampling done to date on the residential wells shows they are free of contamination due to the York Oil Site. If the site were left as it is, there might be a potential for future impact on residential wells. However, the remedial program proposed for the site and the monitoring of the remedial program's effects will eliminate this potential. Based upon this, a residential water supply system does not appear to be justified at the York Oil Site.

Comment:

The time from identification of the site until the present is approaching ten years. When can we anticipate that the final portions of this project will be completed.

Response:

We can now anticipate that we would begin the design phase of this project during the first or second quarter of 1988 and be ready to commence construction in 1989.

Comment:

A significant portion of discussion at the public meeting centered around the appropriate permanent remedy to be implemented at the site.

Response:

There was not yet agreement between the USEPA and NYSDEC at the time of the public meeting. The NYSDEC through its consultant had recommended a thermal destruction alternative whereas the USEPA had chosen a solidification process as the preferred alternative. The consensus of those attending the public meeting appeared to be that the solidification process was really not a permanent technology.

Comment:

There were several comments that the choosing of a ten ppm cleanup level for PCB was not appropriate nor established by regulation.

Response:

A national PCB cleanup policy of ten ppm for PCB in residential areas was established on April 2, 1987 at (52 FED.REG.10688). USEPA has adopted the National PCB Cleanup Policy.

Comment:

It was asked why the material at the site could not be left in place since they had previously been solidified with cement and cement products in 1981.

Response:

The findings of our study were that the solidification process undertaken in 1981 was a temporary remedial measure which was not effective in permanently stabilizing or immobilizing these materials.

Comment:

Several of the comments dealt with the fact that the report used the highest found concentration of various contaminants in its health risk assessment.

Response:

The health risk reassessment was done to assess the worst case. It is EPA's policy to use the highest values found.

Comment:

Several comments dealt with the fact that the report did not include information which had previously been included in the earlier Remedial Investigation/Feasibility Study.

Response:

The current report is an Addendum Feasibility which is a supplement to the original Remedial Investigation/ Feasibility Study (RI/FS).

Comment:

One comment stated that the sample analysis did not show contamination of the groundwater above the 10 ppm action level. (Note: This comment is in reference to the groundwater standard for PCB).

Response:

The regulatory action level for PCB in groundwater is .0001 ppm (i.e. 6 NYCRR 703).

Comment:

Several of the comments dealt with the use of a limited data base to draw conclusions.

Response:

No matter how many data points or samples are collected, the data base will always be limited in some aspects. The Department has determined there was a sufficient data base to draw valid conclusions.

Comment:

One comment states that the report introduced a concept of not being able to use water on the site as unpolluted drinking water in the future. The commentator further stated that it seems inappropriate since there are no surface water intakes for many miles from the site.

Response:

The mere fact that there are no current uses of this surface water for drinking at this time does not preclude the possibility of that use in the future.

Comment:

A recommendation of thermal treatment, before treatability studies have been conducted, is inappropriate and unsupportable.

Response:

A recommendation for use of thermal treatment was based on our consultant's literature search. The literature search findings indicates that the thermal treatment option was the most promising of the three identified permanent technologies. A treatability study will be a necessary part in the design phase of this project. Similarly, if either one of the other two permanent options is selected, a treatability study would also have to be completed during the design phase.

Comment:

Reference was made to the statement in paragraph two on page 17 of the RI/FS that during current and previous field activities by GZA, the existing collection system (filter chamber near the outlet of lagoon 3 to collect oils exiting the lagoon) was generally free of water with no oil visible on the sorbent pads. This statement suggests that the contamination found in the drainage areas is from an earlier oil spill and not from the release of contaminants from the material currently in the fixed lagoons.

Response:

The contamination found in the drainage area around the southern fence of the site is not from earlier oil spills. The drainage ditch which runs along the southern boundary of the fenced area at the railroad currently contains floating oils which are seeping out of the ground and are periodically removed by a contractor working for the Department.

Comment:

EPA's 1984 Draft PCB Clean Up Policies are referenced throughout the report. This policy was never adopted by EPA and is now obsolete. The agency issued a final policy establishing a National PCB Clean Up Policy on April 2, 1987 (52 Fed. Reg. 10688). Most recent final policy should be referenced and applied. It should be noted that the Agency's present clean up level for soils and low contact restricted access areas is 25 ppm.

Response:

The commenter was correct that the draft PCB clean up policy was referenced throughout rather than an appropriate referenced final rule. However, this specific issue is not substantive since the USEPA, NYSDEC and our consultants were cognizant of the final rule. Briefly, the final rule was used in the Agency's decision making, however the report did not incorporate the final rule. In response to the second portion of the comment regarding, use of a 10 ppm versus a 25 ppm clean up level in the soils, the Agency's do not agree with the commenters position that the York Oil Site is a restricted access area as described in the final rule. The Agency's reasons for making this determination are that the area to be remediated is not completely fenced and it does not meet the intent of a restricted zone (i.e., there is no commercial or industrial activity currently at the site which would provide continuous control over access to the site).

Comment:

Other than stating that it is a DEC action level, the report gives no basis for choosing a 10 ppm clean up level. The scientific and environmental basis for choosing this level or any level should be discussed and documented.

Response:

In response to a previous comment, it was established that a PCB clean up policy level had been implemented by EPA. Using a 10 miligram per kilogram concentration of PCB to determine carcenogenic risk associated with leaving PCB's at 10 ppm in soils, the risk analysis formulas produce the following numbers:

The residual risk due to soil ingestion is an increase risk of 4.3 in a 100,000 and the residual risk due to soil/skin direct contact is an increase in risk of 8.25 in a 1,000,000.

Thereby the health risk assessment is supportive of a 10 milligram per kilogram action level.

Comment:

Because zinc is not regulated in the drinking water standards by EPA, using zinc as a factor in any of the risk assessments is inappropriate.

Response:

NYSDEC has established a groundwater standard for zinc of 5 parts per million.

Comment:

An assumed gastrointestinal absorption of 100 percent was applied in assessing the risk of drinking PCB contaminated groundwater. The assumed dermal absorption factor for inorganics was 50 percent. More realistic and appropriate factors for gastrointestinal and dermal absorption are 15 to 30 percent and 1 percent respectively.

Response:

At the time of writing the health assessment, USEPA was contacted by our consultant. EPA's response to the inquiries regarding absorption factors was that there were no published absorption rates. Thereby, it was appropriate for our consultant to use a conservative number for assessing absorption.

Comment:

Does the report include information from groundwater wells installed earlier, or only the 57 new wells? If none of the earlier data was used, why not?

Response:

There appears to be some confusion on the part of the commenter since this current report is an Addendum to the original RI/FS which means that in any assessment all data collected since the beginning of all studies was used.

Comment:

Page 2-3, Paragraph 2, indicates that lab data from the 1985 study are not included. However, it appears that only selected results from the 1985 study are mentioned in this report. What was the criteria employed in selecting the data included?

Response:

All available data from the 1985 study was assessed.

Comment:

Page 2-7-This table contains subjective observations rather than measurements. The terms "oil soaked", "oil sludge", and" oil and oil stained", and "oil pockets" should be defined. Also, the term "possible oil stains" is confusing.

Response:

The terms oil soaked or oil sludge were used to record the visible observations as to the nature of the material collected or sampled. Use of any one of the descriptors using the word oil was an indicator to those persons doing the assessment of contamination to make determinations to what samples would be analyzed by the laboratory or by the on-site portable GC. The presence of "oil" is not the basis for determining the extent of the remedial action, rather the results of laboratory analyses regarding the presence and concentrations of PCBs.

Comment:

Page 2-7 and 2-8 under Remarks - What does Erdman Anthony Associates mean by suspected and possible?

Response:

The subjective qualifier terms of "suspected" and "possible" were used by the field personnel to identify samples that were not obviously visibly contaminated or laden with oil. However, these samples contained some type of staining which indicated the need to have them analyzed to determine whether or not they were actually contaminated.

Comment:

Two of the comments provided by Alcoa numbered 16 and 17 in their section number II labeled "Specific Comments" dealt with the hydrogeology of the site. These questions dealt with the proper interpretations of the hydrogeology. For these specific comments you should refer to the questions as shown in the exhibits.

Response:

The Department assessed these questions and believes the report is correct as written.

Comment:

Page 2-11 - 3rd paragraph - PCB aroclors need to be identified. (They are not listed on table 2-3 either).

Response:

From a regulatory standpoint only total PCB is regulated thereby listing of specific aroclors is not needed.

Comment:

Page 2-15 - paragraph 2 - mentions widespread surface water contamination. However, the data sets suggested that only one or two surface water samples were analyzed. How can widespread contamination be determined with so few samples?

The term "hot spots" is used to describe areas of PCB contamination. This term should be defined.

The last paragraph discusses how insoluble materials are moving through the groundwaters system. It is generally believed that insoluble materials move extremely slowly, if at all in a typical groundwater system. Oil and PCB's will probably not move with the water or perhaps will not move at all.

Response:

As discussed in response to a previous question the data base is not limited to that as presented in this Addendum. It is the entire data base as presented in both the Addendum and Remedial Investigation/Feasibility Study (RI/FS). The term "hot spot" was used to describe areas of PCB contamination in soils of greater than the 10 milligrams per kilogram. In response to the last item of the question the findings of our studies have shown that insoluable materials are moving through the hydrogeological system.

Comment:

Page 2-15 - 1st paragraph - the term apparently should be eliminated.

Response:

The qualifier "apparently" is appropriate in this situation since it indicates that contamination was not identified at the analytical method detection limits.

Comment:

Page 2-16 - the statement is made that the water soluble components tend to sink ... what is the basis for this statement?

Response:

A rereading of the entire first paragraph on page 2-16 indicates that the contaminant being discussed is total phenolics which forms a density plume of the type that tends to sink. Further the studies and the analytical chemistry showed this to be a valid assumption.

Comment:

Page 4-1 - At the bottom of the page a statement is made that "it has been established that PCB levels in the 0-10 ppm range, should be managed to eliminate human exposure ... this is not in accord with the EPA's most recent and final cleanup policy that calls for spill cleanup to various levels ... some above 10 ppm.

Response:

The use of the term "management" in this situation is similar to the EPA cleanup policy which specifies that material is to be covered to prevent direct human contact.

Comment:

Page 2-2 - the results of the field screening using the portable gas chromatagraph (GC) should be, but are not, discussed in the report.

Response:

The results of the field screening is presented in the report (See Addendum Feasibility Study Report, Appendix Vol. 1, Appendix C).

Comment:

Page 4-2 - Paragraph one states that it is anticipated that the cleanup limits will approach the lower end of the established limits. What is the basis for this determination ... particularly since the indications are that surface water does not contain contaminants and that the groundwater in a usable zone is not impacted?

Response:

The statement that it is anticipated that the cleanup limits will approach the lower end of the established limits since that area of contamination is quite well defined. Contaminated material will either be detoxified or stabilized if it is in excess of the 10 ppm action level. Less contaminated materials on the remainder of the site will end up being under the final cover placed at the site.

Comment:

Boring YO-54 and YO-32 are mentioned as having PCB levels above the action level. However, the data in Appendix C shows that the levels found are not above the 10 ppm action level.

Response:

A rereading of Appendix C indicates that levels of PCB greater than 10 ppm were not found by the portable GC. However, confirming work at the contract laboratory identified PCB's in excess of the 10 ppm action level.

Comment:

Paragraph 3 suggested that data is available to draw contours of the PCB contamination, yet the data are not included in the report.

Response:

Taking into consideration all data presented in the Addendum and the original Remedial Investigation/Feasibility Study there is sufficient data available to develop PCB concentration isopleths.

Comment:

Page 4-5 - the data presentation in Table 4-2 is unsatisfactory. In addition to the high and low values, it would be helpful and appropriate to present the average of all samples taken. It would also be helpful to have all the results tabulated in an easily understood table. Evidentially, at least 60 soil samples taken at the site showed zero contamination of PCB's, and many showed levels that were only slightly above the detection limits.

Response:

To present the average of all samples taken is inappropriate since the methodology used in the field to assess a site entails taking a number of samples to determine a area of 0 contamination. Averaging all the results of these essentially "clean" samples would give an erroneous low number.

Comment:

Page 4-6 - paragraph 3 - it is stated that the 1985 study determined that the oil sludge layer may be serving as a reservoir for potential contaminants. However, the data presented in this report do not seem to confirm that.

Response:

Based on the findings of this study it appears that the oil sludge layer serves as a reservoir for the phenolics plume which is exiting the site. We feel this interpretation is correct.

Comment:

Page 4-9A "Plume" of phenolic contamination is discussed in paragraph 4. However, the number of samples available seem to be inadequate to define a plume. Table 4-4 suggests that phenol was detected only one of nine groundwater samples analyzed.

Response:

The 1985 RI/FS includes the additional data on the phenolic compounds in groundwater.

Comment:

Page 4-22 - PCB's are listed as a probable human carcinogen. There are no data to suggest this. It should be listed as a suspected human carcinogen or as an animal carcinogen.

Response:

The term "probable" was taken from USEPA's guidance document on writing health risk assessments entitled the Superfund Public Health Evaluation Manual of October 8, 1986 at Table 4-7 on Page 4-23. NYSDEC and USEPA believe this term is appropriate.

Comment:

Page 4-40 - in paragraph one, it is stated that observed maximum concentrations for various compounds exceed the Applicable or Relevant and Appropriate Standard (ARAR), by at least 600 times. It should be noted that the PCB concentration used are in oil, while the ARAR's sited are for water. If the water sample concentrations were used the ratios for PCB's would be several orders of magnitude less.

Response:

It is possible for a water supply to provide water that would contain oil which would not be noted visibly and thereby contaminants could be ingested at the concentration indicated in the samples used in table 4-11.

Comment:

Page 5-47 - 3rd paragraph - EA has assumed that there will be cleanup associated with the pathway study, such an assumption is inappropriate at this time.

Response:

EA suggestion that on-site cleanup be performed in conjunction with a pathway cleanup activities is in the form of a recommendation to the State. Such a recommendation is appropriate based on their findings. Briefly the purpose of EA's work was to assess the situation, draw conclusions, and make recommendations.

Comment:

Page 50 - Conclusion eight discusses the "plume" of PCB contamination in the shallow groundwater. The implication is that the plume has a PCB concentration of 120 mg/l. However, only one oil sample, collected in a drainage trench, was at that level. How can that sample be used to define a plume?

Response:

Oil was found in various monitoring wells, also a visual observation of the oil seeping out of the soil into the drainage trench along the railroad grade indicates that a plume exists.

Comment:

The contamination present on the site is due solely to spilled material caused by the overturning of tanks at the site.

Response:

The findings of the RI/FS study do not support this contention.

Comment:

Two commentators suggested that the preferred option should be grading the site and putting on cover material and reseding along with disposal of the oils stored at the site in the tanks.

Response:

We believe suc a remedy is not complete, for example, it would not addres subsurface contamination and would not recover PCB contamnated oils, etc. It would also not be a preferred remedy a required required by CERCLA Section 121(b).

Comment:

Two verbal coments were received concerning the appropriate remedy one at the public meeting and another through a telephon conversation with the Department. Both comments were in fvor of using a thermal treatment option rather than a solidification option. They felt that the solidification option was not a permanent remedy. Further even if solidification was technically permanent, those commenting had reservations regarding the impact on their property values sine the site may continue to be perceived as being hazardous.

Response:

USEPA believes that soils solidification is an available and reliable technology for the treatment of waste types identified at the site. Solidification satisfies CERCLA Section 121 requirements for utilizing a remedy that permanently immobilizes and reduces the toxicity and mobility of the waste at the site. Solidification of the soils provides the same degree of protection to human health and the environment as the other treatment options, but at a lower cost.

The intent of the remedy for the site is to protect human health and the environment. The final step for this remedial project will be to deem the site non-hazardous and to remove it from the National Priorities List. The impact of the remedy on property values is unknown and unpredictable. It is anticipated, however, that since the York Oil site would no longer be designated a hazardous waste site following deleting, there would be a positive impact on property valu

Comment:

Page 6-72-Cost estimates are difficult to challange without detailed study, however, the cost estimate to excavate, incinerate and backfill 30,000 cubic yards of moist soil for $9,165,00 seems really modest. If this represents 50,000 tons of material, the estimated cost is $183 per ton. Incineration cost alone usually range above $500 per ton for materials with low or no BTU value. More details on the cost estimate should be provided.

Response:

The $183 per ton cost estimate is not related to total project cost. The total estimated project cost for thermal destruction is $15,052,977. In relation to total project cost, the estimated cost for thermal destruction as presented in the report is $301 per ton. The $301 per ton is representative of the cost ranges identified by EA during their research.

Comment:

Page 7-8-Second Paragraph, Under Cost Comparison, Alternative No. 5A is 2.5 times as expensive as the least expensive alternative.

Response:

The Superfund Amendments and Reauthorization Act (SARA) specifies that preference be given to alternatives that provide permanent solutions. SARA also requires that the selected remedy protect human health and the environment. The least cost alternative does not achieve these goals.

Comment:

Page 11 of GZA's report -- Are the results of the field test for PCB recorded in the report?

Response:

Yes (See Appendix C).

Comment:

Page 14 of GZA's Report - The statement is made that moisture content estimates were made in the soil and sediment samples, and the estimates were purposefully made higher because high estimates would make the PCB content results higher as well. Such procedures are inappropriate and reduce the credibility of the results.

Response:

NYSDEC believes that the possible difference between the estimated and actual moisture content would only introduce a possible variation of approximately ten percent between the actual and reported concentrations. Additionally several duplicate samples were analyzed by the contract laboratory. Goldberg Ziono Associates values for the GC work performed in the field were typically lower than the contract laboratory results reported for the duplicate samples. NYSDEC believes that even if the results reported by Goldberg Ziono Associates were slightly high due to an estimated moisture content, this variation did not in any manner influence the decision-making process. Comment:

Comment:

Page 32, Paragraph 2, states that boring YO54 showed PCB levels of 20 mg/kg. The table in Appendix C shows ND (i.e., Non-Detect) and BDL (i.e., Below Method Detection Limit) as the levels measured by GZA. The split spoon data also indicate ND levels of PCB in this boring.

Response:

The data referenced in the comment was produced by a portable GC in the field. The recorded data of 20 mg/kg was as reported by the contract laboratory.

Comment:

Page 32 - There is no basis for the statement at the bottom of the page that "it is assumed that much of the former Lagoon 3 contains PCBs greater than 10 mg/kg."

Response:

If all data available are examined, it will be found that the statement regarding Lagoon No. 3 as prepared by GZA is a valid assumption.

Comment:

Page 33 - Paragraph 3, attempts to describe possible analytical problems associated with the CLP (i.e., Contract Laboratory Procedure) test procedures used for the PCB determination. If appropriate spikes were used and appropriate spike recoveries were within acceptable limits, the test results should be valid. If the test results were not valid, the data should not be relied upon.

Response:

The test results were accepted as being valid. It should be noted that the actual quantity of material to be cleaned up was based upon the analytical data showing PCBs present at greater than the 10 ppm action level.

Comment:

Recommended remedial alternatives, far exceed, in scope and cost, those necessary to protect human health and the environment and are inconsistent with National Contingency Plan.

Response:

The recommended alternatives are in accordance with the requirements with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Specifically, Section 121(d) of CERCLA requires the following: "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminates is a principal element, are to be preferred over remedial actions not involving such treatment. The off-site transport and disposal of hazardous substances or contaminated materials without such treatment, should be the least favored alternative remedial action where practicable treatment technologies are available." It is possible that there are inconsistencies with the National Contingency Plan since revision of the plan as required under CERCLA is yet to be completed. Thereby, both the National Contingency Plan and CERCLA as amended must be referenced, with the CERCLA provisions taking preference, in order to make the proper interpretations. It is the Agency's position that our interpretations are in accordance with CERCLA.

Comment:

Recommended remedial alternatives employing site excavation present the highest exposure risk to workers and the community.

Response:

This comment is only correct in the context that the remedial alternatives involving excavation present the highest exposure risk during construction. Engineering controls will be employed during construction to minimize risk to both workers and the community. The engineering controls implemented would be such that the actual exposure to workers and the community would not present an actual health risk.

Comment:

Information currently available indicates that significant error is contained in the cost estimates for Option 5A, resulting in a substantial understatment of the true cost of this alternative. The commentor also appended information regarding the cost of known incinerators (e.g. the operating cost for one mobile incinerator was in the range of $300 to $1,000 per ton and for the other it was in the range of $300 to $400 per ton of contaminated soil).

Response:

The estimated cost for Option 5A, Excavation and Thermal Treatment, as presented in the Addendum FS is approximately $15 million. The amount of material estimated for thermal destruction is approximately 50,000 tons. These dollar amounts back figure to an estimated cost of approximately $300 per ton for the thermal treatment option. It should be noted that the $300 per ton cost figure is within the range as presented by the commentor.

Comment:

The Citizen Participation Specialist for NYSDEC, Region 5, informed those present at the public meeting that if they felt they needed additional time to submit comments (i.e., the end of official comment period was two days after the meeting) that they should make such requests in writing to the Department.

Response:

The general public did not request an extension to the public comment period. In response to a request from the Potentially Responsible Parties, however, the comment period was extended fr December 18, 1987 to January 15, 1988.

Comment:

Alcoa's letter of December 29, 1987 addressed to Elena Kissel, USEPA, dealt with the Addendum Feasibility Study ("Addendum FS") for the York Oil site in Moira, New York. The purpose of the letter was; 1) to clarify ALCOA's comments on the Addendum FS that were presented to USEPA and the New York State Department of Environmental Conservation ("NYSDEC") at a meeting held in Albany on December 17, 1987, and 2) to voice ALCOA's concern it was not advised that USEPA and the NYSDEC were considering thermal treatment as an alternative remedial action for the York Oil site. ALCOA specifically mentioned a November 25, 1987 letter received from Elena Kissel which stated that "the preferred remedial action for the York Oil site at this time includes site excavation, on-site solidification of soils, thermal destruction of tank and other oils ..." ALCOA also requested a 30 day extension in the public comment period.

Response:

ALCOA's reliance on the letter dated November 25, 1987 as precluding other remedies is not supportable. The Addendum FS clearly outlines the thermal treatment option. The November 25 letter in no way indicated that USEPA had made a final selection of a remedy. The selection of a remedy is not finalized until a Record of Decision ("ROD") is signed by the USEPA's Regional Administrator.

ALCOA was given an extension in the comment period. On December 31, 1987, Elena Kissel telephoned the attorneys' for ALCOA, Reynolds and Kenneth Pierce, to inform them that the public comment period would be extended to allow comments to be submitted to USEPA on or before January 15, 1988.

Comment:

Reynolds requested a 30 day extension in the public comment period for the York Oil Addendum FS. Reynolds request was based on its belief that USEPA's "apparent shift" from the position outlined in a November 25, 1987 letter from USEPA to Reynolds, effectively denied Reynolds an opportunity to comment on the remedy. This "apparent shift" was from USEPA's selection of solidification to thermal treatment as a remedy for the York Oil site.

Response:

Reynolds claim that it was denied an effective opportunity to comment on the Addendum FS because USEPA shifted its remedy from solidification to thermal treatment at the York Oil site is not supportable. The Addendum FS clearly outlines the thermal treatment option. The November 25, 1987 letter in no way indicated that USEPA had made a final selection of a remedy for the York Oil site. The selection of a remedy is not finalized until a Record of Decision ("ROD") is signed by USEPA's Regional Administrator.

Reynolds request for a thirty day extension in the public comment period was denied. Reynolds attorney had been contacted on December 31, 1987 and had been given an extension until January 15, 1988.

Comment:

Franklin County is concerned that if USEPA selects solidification as the remedy for the York Oil site, that the county "will forever hold title to this unattractive plot of land." The Franklin County legislature passed a resolution (No. 5) on January 7, 1988 specifically stating that the county's order of preference for remedial alternatives at the York Oil site is first, the removal of all hazardous materials from the site, second, thermal treatment and last, solidification.

The county also inquired as to what future liability the site would pose to Franklin County and whether or not the USEPA intends to relieve the county of all liability associated with hazardous material stored in a solid state on county owned property.

Response:

The selection of a remedy for the York Oil site will be made by the NYSDEC and the USEPA on the basis of criteria outlined in the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"). Section 121 of CERCLA provides that the remedial action selected must be protective of human health and the environment, must be cost effective and must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The potential of liability to Franklin County in the current action or a future action under CERCLA, is governed under CERCLA Section 107(b), which outlines defenses to liability, and Section 101(20)(A)(iii) which excludes from the definition of owner or operator, "any facility, title or control of which was conveyed due to bankruptcy, foreclosure, tax delinquency, abandonment, or similar means to a unit of state or local government ....".

The potential liability of Franklin County once the remedial project is complete and the site is removed from the National Priorities List is not addressed in CERCLA. USEPA has deemed the solidification remedy to be a permanent treatment option, however, since the solidified soil will remain on-site, the "Review" provisions specified in Section 121(c) requiring review of remedial actions no less often than every five years, would be applicable.

EXHIBIT IV

DOH STATE OF NEW YORK
DEPARTMENT OF HEALTH
Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 12237

David Axelrod, M.D.
Commissioner

December 30, 1987

Mr. James Ludlam
NYS Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-0001

Dear Mr. Ludlam:

Please find attached our responses to specific and general comments raised by both Alcoa and Reynold's Aluminum regarding the Addendum Feasibility Study for the York Oil Site, (T) Moira, Franklin County.

Please forward these to Dan Steenberge for inclusion in the Responsiveness Summary.

If you have any further questions, please call me at 458-6310.

Sincerely,

Gary A. Litwin
Program Research Specialist III
Bureau of Environmental Exposure
Investigation

RECEIVED
JAN 13 1988
Dept. of Environmental Conservation
REGIONAL ENGINEER - REGION 5
RAY BROOK, NEW YORK 12977

Responses to Aloca's Comments

#3 The levels of PCB's in the water used for a risk assessment are orders of magnitude above the PCB solubility limit. However, the water is carrying free phase oil, and the sediments in the wetland contain up to 210 ppm. This shows that the water is carrying PCB's at high levels regardless if it is dissolved or not. The exposure levels used are appropriate.

#25 The low level (0-10 ppm) PCB's will be managed to eliminate exposure. This does not mean that they will receive the same treatment as the higher levels of PCB. However, it is not reasonable to leave these low level materials exposed. Some sort of management is required, whether it is removal, covering them, or some other method.

#33 (1st Part) The worst case soil sample from 20 feet below grade contained 31.5 mg/kg PCB. The worst case surface soil on-site contained PCB's at 17 mg/kg. The deep and surface levels are of the same order of magnitude. Since, the levels are close, it is not unreasonable to use the worst case soil sample found regardless of where it is found. Even if the surface sample is used, it would not make a significant difference in the risk assessment. Furthermore, the distrubance of the soil structure during remediation, may make the deep soil levels more relevant. (2nd Part) See response to comment #3.

#35 See response to comment #33.

#36 See response to comment #33.

#37 See response to comment #3.

#40 The soil sampling was done in order to define the extent of contamination. This necessitated a large number of non-detect or low level samples, in order to define all of the isopleths. An average level of all the samples is not appropriate. (Part 2) See response to comment #33.

#41 See response to comment #3.

#42 See response to comment #3.

#43 While the workers at the town garage may be exposed to other sources of hazardous compounds, the purpose of the risk assessment is to determine th exposure from the site.

#44 See response to comment #33.

#45 The report does not limit its treatment of drinking water to on-site. Considering the obvious releases from the site, the consideration of the use of water for drinking and other uses is appropriate.

#46 See responses to comments #3 and #33.

#52 See repsonse to comment #51.

#55 See response to comments #3 an #33.

Reynolds

Draft Response to Comment 3

Documentation for the statements about the human carcinogenicity of Aroclors 1260, 1254 and 1248 was not provided, therefore, the scientific basis for these statements cannot be evaluated. However, the statement that Aroclors 1254 and 1260 "are not considered to be carcinogenic to animals" is incorrect. Two studies showed the carcinogenicity of Aroclor 1260 in rats (Kimbrough et al., 1974; Norback and Weltman, 1985) and a third study showed the carcinogenicity of Aroclor 1254 in rats (Ward, 1985). In addition, the US EPA (1987) considers these compounds, as well as Kaneclor 500, Clophen A-60 and Clophen A-30 to be animal carcinogens. Similarly, both the International Agency for Research on Cancer (IARC, 1982) and the National Toxicology Program (NTP, 1985) consider PCBs as a group of compounds that are carcinogenic in animals.

Furthermore, the US EPA (1987), IARC (1982) and the NTP (1985) all consider the evidence on the human carcinogenicity of PCBs to be inadequate (conclusions on their carcinogenicity cannot be made on the basis of the available data). Consequently, given the positive animal data and the inadequate human data, the US EPA considers PCBs to be probable human carcinogens, the NTP considers PCBs to be a group of substances that may reasonably be anticipated to be human carcinogens and IARC considers PCBs as compounds that, for practical purposes, should be treated as compounds presenting a carcinogenic risk to humans. These conclusions are all in accordance with the Office of Science and Technology Policy's (OSTP, 1985) guidelines for assessing cancer risks from chemicals when animals data is positive and human data are lacking.

Alcoa

Draft Response to Comment 5

Documentation for the statement that only those "isomers of PCB with 60% or greater chlorine content are suspected carcinogens" was not provided, therefore, the scientific basis for the statement cannot be evaluated. However, the statement is incorrect. Undoubtly, Dr. Roberts was discussing the carcinogenicity of commerical mixtures of Aroclors as he concluded that only those mixtures (i.e., Aroclors) with a chlorine content (by weight) of greater than 60% are carcinogenic in animals. He could not be discussing isomers because the carcinogenic agents in commerical mixtures of PCBs have not been identified.

However, the opinion of Dr. Roberts regarding the carcinogenicity of Aroclors is not held by the US EPA (1987) (see response-to-comment 3 of Reynolds). The evidence is clear that Clophen A-30 (a commerical mixture with only 30% chlorine) and Aroclor 1254 (a commerical mixture with 54% chlorine) are carcinogenic in rats (Schaeffer et al., 1984; Kimbrough et al., 1975).

Aroclors 1242 and 1248 are not "PCB isomers" but commerical mixtures containing a large number of PCB congeners.

In their most recent review of PCB toxicity, the US EPA (1987) concluded there is no information regarding which constituents of any PCB mixture are the active carcinogenic moieties, therefore, Aroclor 1260 will be assumed to be representative of all mixtures and the cancer potency factor of 7.7 (mg/kg/day)$^{-1}$ derived from studies with Arcolor 1260 will apply to all PCB mixtures.

Draft Response to Comment ,

Documentation to support the estimate that the gastrointestinal absorption factor for PCBs in drinking water should be 15-30% was not provided, therefore, the scientific basis for the estimate cannot be evaluated. However, limited evidence in humans indicates PCBs are absorbed in the gastrointestinal tract (quantitative evidence on the amount absorbed is unavailable) and animal data, including that for rhesus monkeys, indicate that over 90% of ingested PCBs are absorbed (Albro and Fishbein, 1972; Allen et al., 1974a, Morales et al., 1979).

Draft Response to Comment 34

Although the toxicities of specific Aroclors was presented in a recent US EPA (1987) review on PCBs, the available evidence is not sufficient to conclude that PCBs with less than 60% chlorine are of less concern than those with more than 60% chlorine.

Available evidence indicates that exposure to Aroclor 1016 (41% chlorine), Aroclor 1248 (48% chlorine) and Aroclor 1254 (54% chlorine) can induce non-carcinogenic systemic toxicity and reproductive toxicity in rhesus monkeys (a valuable surrogate animal model for humans) at relatively low doses (Barsotti and Van Miller, 1984; Barsotti et al., 1976; Allen and Barsotti, 1976; Tryphonas et al., 1986a,b). In addition, there are no good data on the non-carcinogenic toxicity of Aroclor 1260 (60% chlorine) in rhesus monkeys and studies in rats indicate that Aroclor 1260 is less toxic to rats that Aroclor 1254 (Linder et al., 1974).

Draft Response to Comment 38

See response-to-comment 3 of Reynolds (second paragraph).

The use of "It" to refer to the large number of commerical mixtures of PCBs is incorrect.

Draft Response to Comment 51

See response-to-comment 6

Draft Response to Comment 53

The potency factor of PCBs is correctly presented as 4.34 $(mg/kg/day)^{-1}$. The statement - "This seems high for a suspected carcinogen." - reflects a misunderstanding regarding the difference between qualitative evidence of carcinogenicity (Is it a carcinogen?) and quantitative evidence of carcinogenicity (What is the dose required to induce a carcinogenic response?).

The potency factor of 4.34 $(mg/kg/day)^{-1}$ was taken from the table found in many US EPA Health Assessment Documents ranking the carcinogenic potencies of 55 chemicals. A more recent estimate is 7.7 $(mg/kg/day)^{-1}$ (US EPA, 1987). Both potency factors were calculated from data obtained from animal studies.

Draft Response to Comment 54

There is no predetermined risk level that is considered by regulatory agencies as acceptable. In general, risks greater than 10^{-6} - 10^{-7} warrent consideration for regulatory action. The determination that a given level of risk is acceptable with respect to clean-up criteria should be made on a case-by-case basis, after all the factors of the case are carefully assessed and after the concerns of all interested parties are addressed. An initial determination that risk levels of 10^{-4} to 10^{-7} may be of public health concern is consistent with this approach

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